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The Great Basin Naturalist

Volume V, 1944

Vasco M. Tanner, *Editor*

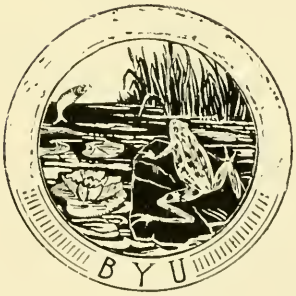

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TABLE OF CONTENTS

Volume V

NUMBERS 1 AND 2, OCTOBER 27, 1944

Page

Four Devastating Melanopli Found in Utah (Orthopera-Cyrtacanthacrinae). W. W. Henderson 1

The European Earwig Found in Provo, Utah. Vasco M. Tanner 22

Dr. William Williams Henderson (1879-1944). Vasco M. Tanner 23

NUMBERS 3 AND 4, DECEMBER 29, 1944

A Taxonomic Study of the Genus Hypsiglena, Wilmer. W Tanner 25

Undescribed Species of Western Nearctic Tipulidae (Diptera). II., Charles P. Alexander 93

Index to Volume V 105

VOLUME V NUMBERS 1 AND 2

The Great Basin Naturalist

October 27, 1944

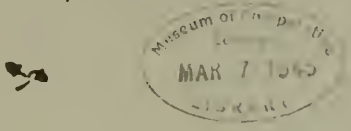

TABLE OF CONTENTS

Page

Four Devastating Melanopli Found in Utah (Orthoptera-Cyrtacanthacrinae), W. W. Henderson 1

The European Earwig Found in Provo, Utah, Vasco M. Tanner 22

Dr. William Williams Henderson (1879-1944), Vasco M. Tanner 23

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FOUR DEVASTATING MELANOPLI FOUND IN UTAH
(Orthoptera – Cyrtacanthacrinae)

W. W. HENDERSON
Professor of Zoology and Entomology, Utah State Agricultural College

1. ARRANGEMENT

Inasmuch as this paper has economic significance, the order of treatment of the four species discussed will be in the descending order of their economic importance to agriculture in Utah. This order is as follows:

Melanoplus mexicanus mexicanus (Saussure)
Melanoplus packardii (Scudder)
Melanoplus bivittatus (Say)
Melanoplus femur-rubrum (DeGeer)

From a strictly taxanomic standpoint, the four species are arranged by Scudder (25) as follows:

26. *M. mexicanus mexicanus (atlanis)* (Saussure)
82. *M. femur-rubrum* (DeGeer)
96. *M. Packardii* (Scudder)
126. *M. bivittatus* (Say)

This arrangement indicates Scudder's idea of the phylogenetic sequence and the numbering implies groups of species coming between the numbers given, so that each of the four species is distinct from any of the other three.

Blatchley (39) gives the same arrangement. Hebard's (51) taxonomic arrangement is now the most extensively used, and is as follows:

M. bivittatus (Say)
M. femur-rubrum femur-rubrum (DeGeer)
M. mexicanus mexicanus (Saussure)
M. packardii (Scudder)

The order of discovery and description of the four species is as follows:

M. femur-rubrum (DeGeer) 1773
M. bivittatus (Say) 1825
M. mexicanus mexicanus (Saussure) 1861
M. packardii (Scudder) 1878

2. OTHER DESTRUCTIVE GRASSHOPPERS

It must not be assumed that the four species treated are the only destructive grasshoppers in Utah. Another species, *M. differentialis* (Thomas), which belongs in the same genus is, at times, highly injurious in limited areas. Up to 1942, this species has been found in Utah only along the Rio Virgin in Washington County, at Kanab in Kane County, on the Green River and at Woodside on the Price River in Emery County, on the Colorado River at Moab and at Castleton in Grand County. *Oedaleonotus enigma* (Scudder), closely allied to *Melanoplus*, is sometimes destructive to dry-farm crops in limited areas. *Camnula pellucida* (Scudder) is one of the most destructive grasshoppers to dry pastures in Utah. There are still others that deserve mention, but this paper is concerned with the four species pointed out, because they are the most devastating of the genus in Utah and because enough material and data have been accumulated to justify some conclusions.

3. MELANOPLUS MEXICANUS MEXICANUS (Saussure)
(See Pl. I fig. 1)

a: Synonymy:

1. 1861—Saussure, *Pezotettix*. (7: p. 160)
2. 1873—Thomas, *Pezotettix*. (11: p. 222)
3. 1875—Riley, *Caloptenus atlanis*. (12: p. 169)
4. 1897—Lugger, *M. atlanis*. (24: pp. 280-283)
5. 1897—Scudder, *M. atlanis*. (25: pp. 178-183)
6. 1897—Scudder, *M. intermedius*. (25: pp. 172-174)
7. 1910—Kirby, *M. atlanis*. (35: p. 512)
8. 1910—Kirby, (35)
9. 1920—Blatchley, *M. atlanis*. (39: pp. 414-416)
10. 1928—Hebard, *mexicanus*. (47: pp. 279-282)

b. Description:

Medium and variable in size. In a group of a hundred or more individuals, the two colors, brown and gray, show up most, both in the

same specimen. In some, the gray prevails over the brown, in other, brown prevails over gray. Both brown and gray vary in the populations from light to dark. The Utah collection indicates that mature specimens are lighter in both colors when they are newly emerged and that the colors deepen and darken as specimens become older.

The most conspicuous color markings are the blackish irregular lines on the upper sides of the thorax, the small blackish spots running in a narrow straight line down the length of the tegminae are narrow and long, usually reaching well beyond the tip of the abdomen, especially in males. The wings are well developed, hyaline and nearly as long as the tegminae. The upper margin of the subanal plate of the males is elevated in the center and cleft to form twin tubercles with an indentation between their bases on the caudal side. The furculae of the male are short, about one-third as long as the supra-genital plate, broad and contiguous in the basal half, very narrow and divergent in the distal half. The cerci of the male are quadrate in the basal half, narrowed one-third and cupped in the distal half.

This brief description is sufficient to distinguish *M. mexicanus mexicanus* from other species found in Utah. For more technical description, reference is made to other works, particularly Scudder (25), and Blatchley (39).

c. Measurements:

Male:

Body length:

Average for 100 specimens 21 mm.
Shortest body in 100 specimens 17 mm.
Longest body in 100 specimens 25 mm.

Hind femora length:

Average for 100 specimens 14 mm.
Shortest femur in 100 specimens 11 mm.
Longest femur in 100 specimens 14 mm.

Tegmina length:

Average for 100 specimens 20 mm.
Shortest tegmina for 100 specimens 15 mm.
Longest tegmina for 100 specimens 23 mm.

Female:

Body length:

Average for 100 specimens 25 mm.
Shortest body in 100 specimens 19 mm.
Longest tegmina for 100 specimens 29 mm.

Hind femora length:
Average for 100 specimens 14 mm.
Shortest femur in 100 specimens 12 mm.
Longest femur in 100 specimens 18 mm.

Tegmina length:
Average for 100 specimens 19 mm.
Shortest tegmina for 100 specimens 14 mm.
Longest tegmina for 100 specimens 24 mm.

d. Geographical Distribution:

Melanoplus mexicanus (Saussure) (7) was described in 1861 from specimens collected in Old Mexico. In 1875, Riley (12) discovered the species in Missouri and described it under the name *Caloptenus atlanis*. In 1876, he (14) discovered it in Illinois. In 1883, Bruner (21) gave the distribution as "Northern United States and British America." By 1897, when Scudder (25) published his "Revision of Melanopli," he had information placing the species in many localities in Canada and Mexico and all the states in the United States except New York, Rhode Island, Delaware, West Virginia, Florida, Ohio, Alabama, Arkansas, Tennessee, Oklahoma and North Dakota. Scudder's Index of 1901 (27) added Kansas, Arkansas and North Dakota to the territory. Caudell (29) added Oklahoma in 1902, and Mead (31) added Ohio in 1904, Morse (32) added Tennessee in the same year.

Riley (23) found the species in 1891 extending northward in North America "nearly to the Arctic Circle" and the "Yukon River," Scudder (26) found by 1898 "it practically covers the whole of North America north of Mexico and is found far within Mexico itself." Hebard (46) says in 1925, "It is generally distributed over all (North America) but the tropical lowlands of Mexico, reaching Northward over all the United States except peninsular Florida and California west of the Sierra Nevada Mountains. It is reported from Yukon River and Alaska."

There are 450 males and 353 females represented in the collection at the Utah State Agricultural College, taken in all the counties of the state except Garfield.

The collections were made by E. G. Titus, C. J. Sorenson, H. J. Pack, H. B. Stafford, G. F. Knowlton, W. S. Thomas, E. W. Anthon, F. C. Harmston, Lowell Cutler, M. J. Janes, Newel Fowler, D. M. Hammond and W. W. Henderson.

The collections date from 1907 to 1942. Earliest collection date

was May 30, latest October 12. The collectors were all students or teachers tied to class rooms and laboratories from October to May, which no doubt accounts for the lack of collections on earlier or on later dates.

e. Economic Importance:

This species not only covers a wide range of territory but a great many kinds of environment. It is found in all sorts of cultivated fields and infests practically all kinds of crops. Corkins (45) says "it has not been known to refuse any cultivated plant and will even gnaw dry wood such as fence posts and the handles of farm tools." It does not occur in swamps and only by accident in damp pastures or in dense forests. It is found in large numbers at low elevations and also in high mountains. Scudder (26) found it common on the top of Mount Washington in New Hampshire and at a level of 9500 feet in American Fork Canyon in Utah. Caudel (28) found the species on the summit of Pike's Peak in Colorado, and Hebard (51) reports it at elevations of 11,000 and 12,000 feet in New Mexico. Marcovitch (40) says the species "was taken on top of Clingman's Dome, elevation 6,612 feet." (Tennessee). Scudder (18) found this destructive species to be "extremely abundant" in "all parts of Colorado to Salt Lake" in 1876 and the same year (19) found it everywhere common in New England. Riley (17) found it "very common in Missouri in 1878." Bruner (21) reported it as "doing damage to crops and vegetation in general" in 1883, and Lugger (24) recorded, "This is one of our most injurious locusts, and almost always found in our state (Minnesota) in destructive numbers." By 1897, Scudder (25) regarded this species "Next to *M. spretus*—the most destructive locust." Morse (32) observed it in 1904 "nearly everywhere" in Tennessee, and said it is "perhaps the most dangerous, potentially, of any species inhabiting the region," and in this same year, Gillette (30) pronounced it "undoubtedly the most generally distributed species of locust in Colorado." Severin and Gilbertson (38) listed it in 1917 among the four species of "grasshoppers which do the greatest amount of damage in South Dakota," and Fox (37) classed it, in the same year, as the "dominant grasshopper east of the (Appalachian) Mountains. Blatchley (39) said in 1920, "This is a very common locust throughout Indiana, having been taken in every county in which collections have been made." In 1921, Morse (42) listed the species among the grasshoppers likely to cause injury in Maine. In the same year, Buckell (41) recorded that "large swarms of *Melanoplus atlanis* had been devouring every-

thing that the settlers planted during the last three years" in certain sections of British Columbia. Hubbel (44) said in 1922, "In point of view of destructiveness, this species surpasses all others in North Dakota," and in the same year (43), "This species far exceeds all others in abundance in this region" (Michigan). In 1928 Hebard (47) found that "undoubtedly *mexicanus mexicanus* is responsible for the greater portion of the damage caused by Orthoptera in Montana, both in cultivation and on the range," and the same author (48) said in 1929, "the most generally distributed grasshopper in Colorado—most destructive species to the native range—not averse to feeding on cultivated crops," and "Gillette (30) considers it one of the most destructive species to the Native range." Hebard also (49) found it "probably the most numerous grasshopper everywhere in the state." (Kansas)? Strand (50) recorded in 1934, "In many of these counties (Montana) the eggs of the lesser migratory locust (*Melanoplus mexicanus*) were so abundant that as high as 30 egg pods, each containing about 20 eggs, could be found per square foot of stubble." In 1938 Isley (54) listed it among the Acrididae of economic importance in Texas. It would seem that Ball et al (55) were well justified in recording *Meanoplus mexicanus mexicanus* (Saussure) as "the most injurious locust in the United States."

Observations in Utah lead to the conclusion that this remarkable insect is the most destructive orthopteriod in the state and this conclusion led to the examination of its economic status elsewhere, only to find the same condition in other states. It might be added, incidentally, that although this insect has been numerous in Utah, there has never been a migratory movement observed.

It would seem that among numerous species struggling for existence, *Melanoplus mexicanus mexicanus* (Saussure) has found the struggle an easy one, or has found the way of successful living. If there is a goal of perfection in locust-hood, this species seems to have arrived at that goal.

4. MELANOPLUS PACKARDII (Scudder) (See Pl. I fig 2)

a. Synonymy:

1. 1875—Scudder, *Caloptenus fasciatus, Acrydii* (*Pezotettix Caloptenus*) (13: p. 76)
2. 1877—Bruner, *Caloptenus fasciatus,* (16: p. 144)
3. 1878—Scudder, *packardii,* (18: p. 289)
4. 1880—Scudder, (20: p. 24)

5. 1883—Bruner, (21: p. 60)
6. 1903—Caudell, (29: p. 88)
7. 1906—Rehn, (33: p. 288)
8. 1910—Kirby, (35: pp. 524-5)
9. 1920—Blatchley, (39: pp. 429-431)
10. 1925—Hebard, (46: p. 36)

b. Description:

The characteristic color of a large number of specimens from many different localities in Utah, displayed together is medium brown, varying in one direction towards yellowish or light brown and in the opposite direction towards deep brown. Among the specimens of lighter shade, some show a slight greenish tinge, and among the specimens of darker shade, a few show a purplish tinge. The conspicuous legs are generally a little lighter in color than the body.

Characteristic markings consist of longitudinal stripes on the head and prothorax, a dark medium stripe, bordered on each side by a much lighter stripe which traverses each shoulder, and this bordered by a blackish stripe on the upper half of side. The markings vary greatly from distinct to very faint; in none of the normal, mature specimens is there a complete absence of all of these stripes. The bright red or pinkish hind tibiae stand out conspicuously, only about one in fifty or more specimens show the tibiae blue.

Head of moderate size; face somewhat slant; compound eyes slightly elongate; *vertex* scutellate, declivent, closed anteriorily; frontal costa slightly narrowed at its beginning, slightly widening downward, then slightly narrowing as it approaches the clypeus. Three transverse incisions cross the dorsal surface of the thorax, the hindmost two continuous on the sides, the most posterior incision slightly behind the middle. Hind femorae with two darker spots crossing the upper margin; plain on the outside.

Tegminae nearly or quite unmarked, usually longer than the abdomen in both sexes; wings well developed, pellucid.

Cerci of the male widest at base, narrowest near the middle and spoon shaped at tip. Furculae widely divergent, extending one-third the length of the supra-anal plate. Subgenital plate strong, conspicuous and slightly pointed at tip.

The initial description by Scudder (13) is a good one. A more complete description is given by Scudder in a later publication (25) and also by Blatchley (39).

c. Measurements:

Male:

Body length:

Average for 100 specimens 28 mm.
Shortest body in 100 specimens 22 mm.
Longest body in 100 specimens 33 mm.

Hind femora length:

Average for 100 specimens 16 mm.
Shortest femur in 100 specimens 13 mm.
Longest femur in 100 specimens 19 mm.

Tegmina length:

Average for 100 specimens 23 mm.
Shortest tegmina for 100 specimens 18 mm.
Longest tegmina for 100 specimens 28 mm.

Female:

Body length:

Average for 100 specimens 33 mm.
Shortest body in 100 specimens 27 mm.
Longest body in 100 specimens 40 mm.

Hind femora length:

Average for 100 specimens 18 mm.
Shortest femur in 100 specimens 15 mm.
Longest femur in 100 specimens 22 mm.

Tegmina length:

Average for 100 specimens 24 mm.
Shortest tegmina for 100 specimens 20 mm.
Longest tegmina for 100 specimens 29 mm.

d. Geographical Distribution:

Melanoplus packardii (Scudder) was described in 1875 (13) from two male specimens taken at Dallas, Texas, and one female taken at Glencoe, Nebraska. Three years later the species was known by Scudder (18) to exist at Great Salt Lake, Utah, South Park and southern Colorado, at Wallula on the Columbia River and in British Columbia, besides Nebraska and Texas. In 1897, Scudder (25) added California, Oregon, Idaho, Montana, Wyoming, Iowa, Kansas, Arkansas, Nevada and New Mexico to the list of states where the species was known to range. Scudder's Index (27) adds Yellowstone, Assiniboine, North Dakota and Minnesota. Hebard (46) says the species is limited on the east to extreme western Minnesota and extreme western Iowa,

eastern Kansas, parts of Oklahoma and Texas, all the states westward and southwestern Canada. *M. packardii* ranges to high elevations, 8,000 to 10,000 feet, in the Rocky Mountains as found by Rehn in 1906 (33).

Summary distribution of *Melanoplus packardii* (Scudder) in Utah, is made from a collection of 163 males and 171 females taken in all counties except Morgan, Wasatch, Daggett, Wayne and Summit. Specimens were collected from 1921 to 1941 by the following workers: W. W. Henderson, G. F. Knowlton, F. K. Stoffers, F. C. Harmston, R. A. Zirker, W. L. Thomas, H. B. Stafford, A. W. Levi, C. J. Sorenson, H. J. Pack, M. J. Janes, F. H. Gunnell, B. J. Whitaker, O. Cannon, J. A. Meacham, and C. L. Nielson. Earliest seasonal date of collection, April 14; latest seasonal date, October 9.

e. Economic Importance:

Scudder said in 1878 (18) that *M. packardii* "is an abundant species" east of the Sierras to Nebraska and from British Columbia to Texas. Abundance of grasshoppers means destructiveness. Gillette recorded in 1904 (30) that it is a "common species over all the eastern portion of the state (Colorado) to the foothills and it also occurs in the grassy glades and mountain parks of the eastern slope to an altitude of 8,000 feet or more." Rocky Mountain states evidently provide a favorable environment for this species. On the other hand, Somes (36) records in 1914, "We have found it sparsely in dry sandy fields and along road sides at Granite Falls, Foxhome, Fergus Falls, Hibbing and Duluth" (Minnesota). Buckell (41) said in 1921 that *M. packardii* is "one of the species responsible for grasshopper outbreaks in Canada." Hubbell (44) pronounced it "moderately common" throughout the state of Michigan in 1922. Hebard (53) said that it is among those grasshoppers which severely menace crops in North Dakota, "one of the most destructive species" on the prairies and plains (47), "one of the most destructive species" in Montana (47) and "we have found it dangerously plentiful in cultivated areas a number of times." (48).

5. MELANOPLUS BIVITTATUS (Say) (See Pl. I fig. 3)

a. Synonymy:

1. 1825—Say, *Gryllus,* (4: p. 308)
2. 1862—Scudder, *Caloptenus,* (8: pp. 465-466)
3. 1873—Thomas, *Caloptenus,* (11: p. 158, 166)
4. 1878—Riley, *Caloptenus,* (17: p. 459)
5. 1897—Scudder, *Melanoplus,* (25: pp. 363-368)

6. 1897—Lugger, (24: pp. 296-298)
7. 1903—Caudell, (28: p. 799)
8. 1906—Rehn and Hebard, (34:)

b. Description:

A large number of specimens examined together look much like so many Packard locusts. They average larger in size than Packards, but in color and markings there is so close a resemblance that amateurs often confuse the two.

The predominating color is brown, ranging from yellowish into dark brown. Newly emerged specimens are light yellowish, often with a tinge of green; old specimens are dark brown with tegminae and wings often worn and shabby. The most conspicuous color markings consist of two long yellowish stripes each of which arises above and in front of the compound eye. The two stripes diverge as they pass caudad along the edge of the pronotum until they reach its tip and then converge down the humeral angle of the tegmina until they meet and continue as a single stripe which fades out toward the tip. The stripes enclose a brownish or yellowish spindle-shaped area on the back.

Head moderate in size, face somewhat slant, cheeks without conspicuous color markings. Scutellum of the vertex and temporal fovoelae feebly impressed in the male, obliterate in the female; frontal carina narrowest at the apex, only slightly widening below and feebly scutellate in the region of the central ocellus, more feebly in the female than the male. Compound eyes moderately large, nearly circular at base, the verticle radius only slightly greater than the horizontal. Antennae about as long as the front legs in the male, sub-equal in the female.

Pronotum widest behind, especially in the female; central carina low but conspicuous; three transverse incisions, the most posterior slightly behind the middle of the pronotum and more distant from the mid-incision than is the most anterior incision. Sides of the pronotum with a black line extending along the upper edge from the anterior margin to the third incision. Legs yellowish, front and middle pairs

Plate I

Fig. 1. Melanoplus Mexicanus Mexicanus (Saussure)
Fig. 2. Melanoplus Packardii (Scudder)
Fig. 3. Melanoplus Bivittatus (Say)
Fig. 4. Melanoplus Femur-Rubrum (De Geer)

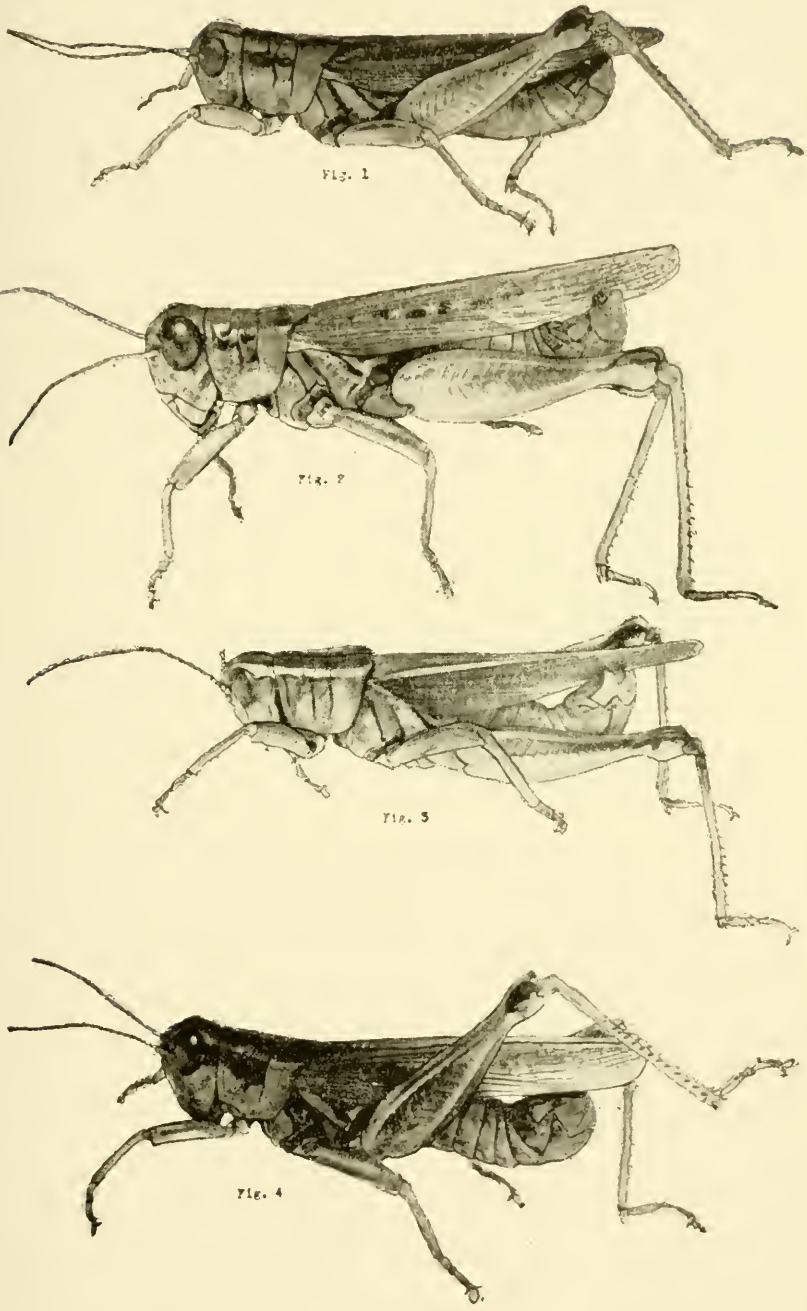

Plate I

without markings, hind legs with a blackish longitudinal stripe on the outer and upper surfaces of the femur, that on the upper edge sometimes discontinuous to form spots; hind tibiae yellowish to greenish black. Tegminae narrow and long, about equaling the abdomen in females but exceeding it in males. Wings medium long, broad and pellucid.

Abdomen elongate, yellowish and without color markings. Anal cerci of the male boot-shaped, viewed from the side with the tip of the boot farthest from the attachment to the body, heel directed posterio-ventrad; furculae vestigial. Subgenital plate with conspicuous tip, strongly elevated and pointed.

For more extensive and more technical description, see Scudder (25) or Blatchley (39).

c. Measurements:

Male:

Body length:

Average for 100 specimens 30 mm.
Shortest body in 100 specimens 26 mm.
Longest body in 100 specimens 35 mm.

Hind femora length:

Average for 100 specimens 24 mm.
Shortest femur in 100 specimens 21 mm.
Longest femur in 100 specimens 29 mm.

Tegmina length:

Average for 100 specimens 18 mm.
Shortest tegmina for 100 specimens 15 mm.
Longest tegmina for 100 specimens 24 mm.

Female:

Body length:

Average for 80 specimens 40 mm.
Shortest body in 80 specimens 32 mm.
Longest body in 80 specimens 48 mm.

Hind femora length:

Average for 80 specimens 28 mm.
Shortest femur in 80 specimens 24 mm.
Longest femur in 80 specimens 35 mm.

Tegmina length:

Average for 80 specimens 22 mm.
Shortest tegmina for 80 specimens 17 mm.
Longest tegmina for 80 specimens 25 mm.

d. Geographical Distribution:

In his "Materials for a monagraph of the North American Orthoptera," published in 1862, Scudder (8) gave the places where the species had been found as Massachusetts, Maine, Connecticut, Maryland, Texas, Nebraska, Illinois, Minnesota and Lake Winnipeg. In 1868 (9), he added "Atlantic states, western part of the country," and Baltimore. In 1872, Thomas (10) recorded the species as being "east of the (Rocky) mountains from New Mexico to Montana, and west of them, from Salt Lake to the North headwaters of the Snake River." The next year (11), 1873, he added states not mentioned before—New York, Pennsylvania, Carolina, Mississippi, Tennessee, Arkansas, Missouri, Kansas, Iowa, Dakota, Colorado, Wyoming, Utah, Idaho. In 1897, Scudder (25) added Ohio, Indiana, Manitoba, Yellowstone, Washington, and several locations in Canada and Mexico. In 1903, Caudell (29) found the species in Oklahoma. Hebard (52) and Ball (55) both record it for Arizona. There seems to be no record of its discovery as yet in Oregon and California or in Alabama and Florida. It is therefore known all over North America except the far north of Canada and the far south of Mexico and southward. It's distribution is apparently highly discontinuous, so that large stretches of territory within the greater limits of the range do not contain it. Scudder (25) says the species is "unknown along the Atlantic seaboard."

The collection of *Melanoplus bivittatus* (Say) in Utah, consists of 134 males and 95 females taken in the following counties: Box Elder, Cache, Weber, Davis, Tooele, Salt Lake, Utah, Wasatch, Duchesne, Uintah, Juab, Millard, Sanpete, Sevier, Emery, Grand, Washington, Kane, Garfield. It was collected by the following workers: W. W. Henderson, G. F. Knowlton, B. G. Whitaker, J. A. Meacham, T. O. Thatcher, R. Rosekelley, A. W. Levi, R. E. Nye, L. Nielson, H. B. Stafford, G. S. Stains, C. J. Sorenson, F. K. Stoffers, Newel Fowler, F. C. Harmston, R. A. Zirker, C. F. Smith, M. J. Janes, W. Thomas, Don Ashdown, Ted Anthon, and R. S. Roberts. Collections were taken from 1921 to 1941; earliest seasonal date, April 27, latest seasonal date, October 25.

e. Economic Importance:

Riley said in 1891 (23) that this species "often becomes locally abundant enough to do much damage to crops." This seems to be the earliest reference to the economic importance of *M. bivittatus*. In 1897, Lugger (24) reported it to be "a very common and destructive locust—found in all parts of the state" (Minnesota). By 1904 Gillette

(30) had discovered it to be "undoubtedly the most injurious grasshopper in Colorado." In more modern literature, Severin and Gilbertson (38) found it among the principal injurious grasshoppers of South Dakota. Morse (42) found it "common throughout New England," "sometimes doing much injury." Blatchley (39) recorded it "one of the most common of our early summer locusts, occurring everywhere throughout the state." (Indiana). Buckell (41) lists it among locusts which periodically cause severe injury to range land, vegetable crops and orchard trees in British Columbia. Morse (42) pronounced *M. bivittatus* "one of our four most dangerous species in the State" (Maine). Hubbel (44) said in 1922, "a considerable portion of the locust injuries are undoubtedly due to the ravages of this species." Corkins (45) found it "the most destructive (grasshopper) species known." It is probable that the last named author has reference to the state of Colorado. Mills (56) noted in 1942 that the species ranks second in importance in Montana. Hebard (53) found it one of "the most destructive species," and Ball's recent summary (55) seems to state the situation especially well when he describes the species as "one of the most injurious in the western United States."

6. MELANOPLUS FEMUR-RUBRUM (De Geer) (See Pl. I fig. 4)

a. Synonymy:

1. 1773—De Geer, *Acridium*, (1: p. 498)
2. 1788—Gmelin, *Cryllus* (*Locusta*) *erythropus*, (2: p. 2086)
3. 1791—Olivier, *Acrydium famorale*, (3: p. 228)
4. 1838—Burmeister, *Caloptenus*, (5: p. 638)
5. 1852—Harris, *Acrydium*, (6: pp. 151-152)
6. 1873—Thomas, *Caloptenus*, (11: p. 163)
7. 1883—Bruner, (21: p. 60)
8. 1897—Scudder, (25: p. 278)
9. 1910—Kirby, (35: p. 522)
10. 1928—Hebard, (47: p. 275)

b. Description:

The three colors, gray, brown and black, each losing itself somewhat in the other two, are the colors which prevail in *Melanoplus femur-rubrum* and in the order given. The purpose served in the harmonious blend of the three colors is to make the insect inconspicuous in its peculiar environment. In some pasture environments, some specimens show a yellowish tinge on the under parts, some show a greenish tinge on the upper parts.

Face nearly straight, that is, almost at right angles to the dorsal line of the head and pronotum. Compound eyes large, scarcely or not at all visible to each other over the vertex, upper tip more forward than the lower tip, front margin nearly straight, hind margin broadly rounded. Scutellum of the vertex well impressed, mostly anterior to the upper tips of the compound eyes and with lateral carinae conspicuous. Frontal carinae narrowest at the apex and widest where it nearly joins the clypeus. Antennae about as long as the head and pronotum together.

Dorsal surface of the pronotum nearly the same width throughout, with mid-dorsal carina low but conspicuous, cut by three transverse incisions, the three closest together at the dorsal carina, the third slightly, if at all, closer to the hind margin than the front. Sides of the pronotum with a conspicuous black band extending from the hind margin of the compound eye along the upper region to the third transverse incision. Tegminae and wings nearly, if not fully, devoid of color pattern, extending to the tip of the abdomen or slightly longer. First and second pairs of legs without color markings, the hind pair with three black spots along the upper, inner margin of the femur; tibiae red.

Abdomen variously colored from yellowish to blackish. Anal circi of the male nearly twice as wide in the basal half as in the distal half. Furculae two-thirds the length of the supra-genital plate, contiguous in the basal third, thence each narrowed on the inner side to the tip. Subanal plate with slightly sinuous, carinate margin.

c. Measurements:

Male:

Body length:

Average for 100 specimens 20 mm.
Shortest body in 100 specimens 18 mm.
Longest body in 100 specimens 24 mm.

Hind femora length:

Average for 100 specimens 12 mm.
Shortest femur in 100 specimens 10 mm.
Longest femur in 100 specimens 14 mm.

Tegmina length:

Average for 100 specimens 16.1 mm.
Shortest tegmina for 100 specimens 13 mm.
Longest tegmina for 100 specimens 20 mm.

Female:

Body length:
Average for 100 specimens 24 mm.
Shortest body in 100 specimens 19 mm.
Longest body in 100 specimens 28 mm.
Hind femora length:
Average for 100 specimens 13 mm.
Shortest femur in 100 specimens 10 mm.
Longest femur in 100 specimens 15 mm.
Tegmina length:
Average for 100 specimens 18 mm.
Shortest tegmina for 100 specimens 6 mm.
Longest tegmina for 100 specimens 23 mm.

d. Geographical distribution:

De Geer (1) described *M. femur-rubrum* from specimens sent to him from Pennsylvania. It may be assumed, therefore, that the species was first known from that state, in the year 1773. Harris says (6) that "It appears to be very generally diffused throughout the United States." Scudder (8) definitely records the species from Massachusetts, Maine, Connecticut, Illinois, Minnesota and Nebraska in 1862. Thomas (10) says in 1872, that Walker claimed to have found the species in Vancouver. The next year he (11) added New York, Maryland, Tennessee, Ohio, Missouri, Kansas, Colorado and Wyoming to previously known *femur-rubrum* territory. Thomas (15) added Iowa to the known distribution in 1876. The species was first collected in Utah by Dr. A. S. Packard in 1877 (20). In 1878, Scudder (18) reported the species from California, Oregon, Texas, Florida, as well as Canada and Mexico. He added Nevada (20) in 1880. When Scudder published his "Revision of Melanopli" in 1897 (25), his record of geographical distribution for *femur-rubrum* included all the states but ten, and many places in Canada and Old Mexico. Kirby (35) recorded the distribution as North America and Mexico in 1910 and Hebard (47) gave it in 1928 as "entire U. S.—Nova Scotia (to) British Columbia—to Atoyac in Vera Cruz."

Summary of distribution of *Melanoplus femur-rubrum* (De Geer) in Utah: 216 males and 176 females are represented in the Utah State collection, taken in the following counties: Box Elder, Cache, Rich, Weber, Davis, Salt Lake, Utah, Summit, Duchesne, Uintah, Juab, Millard, Sanpete, Sevier, Carbon, Emery, Grand, Washington, Wayne, Garfield, Kane and San Juan. They were collected by the following workers: W. W. Henderson, Geo. F. Knowlton, B. A. Haws, C. J.

Sorenson, E. W. Anthon, R. S. Roberts, F. C. Harmston, Geo. B. Harmston, A. W. Levi, C. L. Nielson, Don Fronk, E. G. Titus, E. J. Gardener, J. A. Meachem, R. E. Nye, T. A. Walquist, L. Cutler, Newel Fowler, D. M. Hammond, Geo. E. King, and H. J. Pack. Collections were made from 1907 to 1941 with the earliest seasonal date, May 15, and the latest, October 9.

e. Economic Importance:

Harris (6) said of *femur-rubrum*, in 1852, "It appears to be very generally diffused throughout the United States, and sometimes so greatly abounds, in certain places, as to be productive of great injury to vegetation." Fernald (22) wrote a quarter of century later, "one of the most common grasshoppers in New England." Riley (23) recorded in 1891, "abundant in Mississippi Valley"—"local damage more or less abundant throughout its range." A few years later, in 1897, Lugger (24) pronounced it "our most common locust (Minnesota) found everywhere and usually in very large numbers."

More recent findings have fully confirmed earlier observations. Gillette (30) writes, "next to *atlanis* the most generally distributed—next to *bivittatus* probably the most injurious species in Colorado." Fox (37) pronounced it "The dominant grasshopper of the Appalation province." Severin and Gilbertson (38) list it as "the principal injurious grasshopper" of South Dakota; Morse (42) says "Probably our most generally distributed and most injurious grasshopper"; Blatchley (39) calls it "the most common and one of the most injurious of our Indiana locusts"; Marcovitch (40) records "common throughout Tennessee — must be considered one of our economic forms"; Buckell (41) has the species listed among those responsible for grasshopper outbreaks in Canada; and again among locusts which periodically cause severe injury to range land, vegetable crops and orchard trees in British Columbia; Morse (42) again says the species "to which most injury done to crops is attributed" in Maine. Hubbell (43) mentions that it is "very common in marshes, lowlands and upland thickets and in forest margins, grassy fields and pastures, cultivated fields, etc." Corkins (45) pronounces it "commonly more abundant (than *mexicanus*) in cultivated fields"; Hebard (47) says it is "usually abundant and probably doing much damage in the aggregate"; but that (46) it "never appears in devastating multitudes"; and that (49) it is "particularly injurious to alfalfa" in Kansas. Ball (55) considered *M. femur-rubrum* to be "one of the most destructive grasshoppers of the United States and Canada."

7. GRASSHOPPER CONTROL IN UTAH

In recent years the United States Bureau of Entomology and Plant Quarantine, has cooperated with the states in a nation-wide grasshopper control program. Methods used have consisted largely in poisoning the insects with sodium arsenite, and in 1943 a sodium fluosilicate bait provided by the government, and used under direct supervision of the local organization. The following table gives an estimate of losses and crop savings effected by the federal-state-county grasshopper control program since 1937:

Table 1—Estimated crop losses, and savings resulting from grasshopper control, 1937–1943.

Year	Estimated Loss	Estimated Saving
1937	$950,000	$854,800
1938	650,000	1,062,350
1939	543,891	674,286
1940	424,363	439,087
1941	451,538	789,089
1942	730,687	797,760
1943	683,308	748,962
Total	$4,433,787	$5,366,334
Average	$ 633,398	$ 766,619

Prepared from material provided by Dr. G. F. Knowlton, state grasshopper control leader.

8. ACKNOWLEDGMENT

The four species of Orthoptera treated in this paper were determined by A. N. Caudel, former Curator of Orthoptera at the United States National Museum. The manuscript has been read and valuable suggestions given by Mr. James A. G. Rehn, Chairman, Publications Committee and Curator of Insects at The Academy of Natural Sciences of Philadelphia. Very much of value in this paper is due these scientists who are in no way responsible for any errors that may be found in the paper.

The illustrations are photographs made by Mr. Wm. C. Matthews of the University of California at Berkeley and retouched in pencil by the author.

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The European Earwig Found in Provo, Utah

In August of this year an insect, that was said to be a pest in the flower garden, was brought to me by Mr. Robert Curtis. He wanted to know what kind of insect it was and how it could be controlled. Upon examination of the specimens they were found to be *Forficula auricularia* Linn., the European Earwig, a new record for this area.

This species is dark brown in color, 10-15 mm. long, body flattened, winged and with well developed forcepts, at the posterior end of the body. The females hibernate by going down into the soil 8 to 10 inches. They come out in the spring, usually some time in April, depending upon the temperature. The female lays her pearly-white eggs, in small masses, in the moist soil or under debris. There is only one generation each year.

This cosmopolitan species has spread throughout the United States and is a serious pest in some areas. It can be controlled with a poison bait or contact spray. Dry white bread and lead arsenate, 16 pounds to one, mixed with a little water is recommended as an effective bait. The reader may get additional information concerning this species from the U. S. D. A. Bull. No 566 by D. W. Jones.

The following species of Earwigs are now known to occur in Utah:

Family Spongiphoridae

Spongovostox apicedentatus (Caud.), St. George, Utah, a tropical, semi-tropical species.

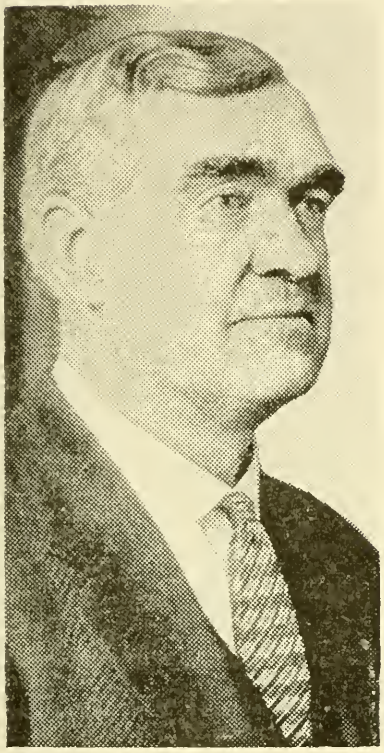
Family Labiidae

Labia minor (Linn.), Provo, cosmopolitan in distribution.

Family Forficulidae

Forficula auricularia Linn., Salt Lake City and Provo, cosmopolitan in distribution.—V. M. T.

Dr. William Williams Henderson (1879-1944)



Dr. Henderson

It is with a distinct note of sadness that we record the death, on October 31, 1944, of Dr. W. W. Henderson, head of the Department of Zoology and Entomology at Utah State Agricultural College, Logan, Utah. Utah academic folk and scientists have lost a wise counselor, a sought after companion, and a most capable teacher. For forty years he was extremely popular as a teacher, and students at the Brigham Young College and Utah State Agricultural College sought his counsel and guidance. He gave freely of his time and energy in service to his fellow men. His kindly spirit motivated for good the lives of all his associates. May his spirit abide in the lives of those on whom he spent it.

Dr. Henderson was born May 23, 1879 at Clarkston, Cache County, Utah, a son of James and Mary Watkins Williams Henderson. He attended the Cache County schools and was graduated from the Brigham Young College at Logan in 1903 with a bachelor's degree. He received his master's degree from Cornell University two years later.

He taught at the Brigham Young College until 1909 when he was appointed President of the Weber Academy at Ogden (now the Weber Junior College) where he served until 1913 at which time he became a member of the Utah State Agricultural College faculty. In 1919 Dr. Henderson was honored by being named President of the Brigham Young College where he remained until 1926 when he rejoined the Utah State College faculty.

In 1925 Dr. Henderson received his doctor of philosophy degree in Entomology from the University of California. In 1928 he played a major role in the founding of the Logan Latter-day Saint Institute where he served as first Director and teacher for one year.

Dr. Henderson married Survina Wheeler at Logan on June 26, 1901; to them were born two sons and seven daughters. Mrs. Henderson, all of their children and six brothers and sisters survive him.

As an Entomologist, Dr. Henderson was well trained, careful and accurate in dealing with research problems and always reluctant to publish his findings until they were thoroughly verified through field and laboratory study. Because of his conscientiousness and ability as a teacher, much of his time was consumed in preparation for class work. As a result his research work and publishing was greatly neglected.

Following is a list of his scientific papers, all of which were published within the state of Utah:

W. W. HENDERSON

1924. A taxonomic and ecological study of the species of the subfamily Oedipodinae (Orthoptera-Acrididae found in Utah. Utah Agricultural Experiment Station. Technical Bulletin No. 191: 1-150.

1931. Crickets and Grasshoppers in Utah. Utah Agricultural Experiment Station. Circular 96: 1-38.

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W. W. HENDERSON and ELDON GARDNER

1935. Grasshopper Egg-Deposition survey of Utah, 1934. Proceedings Utah Academy of Sciences, Arts and Letters. Volume 12: 229-232.

1935. Grasshopper Egg-Deposition survey of Utah, 1934 (abstract). Proceedings Utah Academy of Sciences, Arts and Letters. Volume 12: 243.

1935. A Cytological study of Spermatogenesis in Anasa Tristis (De Geer). Abstract. Proceedings Utah Academy of Sciences, Arts and Letters. Volume 12: 241.

W. W. HENDERSON and ALEXANDER LEVI

1938. Walking-sticks found in Utah. Proceedings Utah Academy of Sciences, Arts and Letters. Volume 15: 93-97; Pl. I.

W. W. HENDERSON

1939. Sources and Outlines for Organic Evolution. Utah State Agricultural College. pp. 1-53.

1941. The Genus Aeoloplides (Orthoptera) in Utah. Proceedings Utah Academy of Sciences, Arts and Letters. Volume 18: 83-87; Pl. I.

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1943. The Genus Phoetaliotes (Orthoptera) in Utah. Proceedings Utah Academy of Sciences, Arts and Letters. Volume 19: 93-97; Pl. I.

The Genus Schistocerca in Utah. Proceedings Utah Academy of Sciences, Arts and Letters. Volume 20: 99-103.

1944. Four devastating Melanopli found in Utah. (Orthoptera-Crytacanthacrinae). The Great Basin Naturalist. Volume 5: 1-22.—V. M. T.

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TABLE OF CONTENTS

Page

A Taxonomic Study of the Genus Hypsiglena, Wilmer W. Tanner 25

Undescribed Species of Western Nearctic Tipulidae (Diptera). II., Charles P. Alexander 93

Index to Volume V 105

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A TAXONOMIC STUDY OF THE GENUS HYPSIGLENA

WILMER W. TANNER[1]
Provo High School, Provo, Utah

INTRODUCTION

In the course of my studies of Utah specimens of the genus Hypsiglena it became apparent that I could better understand this genus if a large series of specimens were secured for study. Accordingly I set out to bring together by loan as many specimens as possible. As a result over 400 specimens have been assembled and studied. This could not have been accomplished without the aid of many workers and institutions who have so graciously allowed me to study their specimens. Unfortunately many areas are still represented by such a few specimens that important problems of variation and distribution still exist. The availability of a large series of Hypsiglena has made it possible to compare most of the species and subspecies of the genus statistically as well as descriptively. The statistical data has provided much needed information used in clarifying the problems in the Leptodeira-Hypsiglena complex. While I have seen many Leptodeira, I have relied on the reports made by Dunn (1936) and Taylor (1938) for the descriptive and statistical information needed for an understanding of this genus.

From the data accumulated I am convinced that Leptodeira and Hypsiglena represent two distinct generic groups, and that Pseudoleptodeira is a tenable genus. In the genus Hypsiglena I accept the following species and subspecies: *torquata, affinis, dunklei, slevini* and *ochrorhynchus* with the following subspecies: *janii, texana, venusta, nuchalatus, deserticola, loreallus, klauberi, tortugaensis,* and *unaocularus.* The last five are described as new in this report. Because of

1 Contriutbion 110, Department of Zoology and Entomology, Brigham Young University, Provo, Utah.

inconclusive data the species *ochrorhynchus* is not united with *torquata* as is suggested by Dunn (1936) and Bogert and Oliver (1945).

The genus Hypsiglena was proposed by Cope on November 15, 1860, at which time he described *ochrorhynchus* (genotype) from Cape San Lucas, Lower California, and *chlorophaea* from Fort Buchanan, Arizona. A few months previous (February 1860) Günther described *torquatus*, but assigned it to the genus Leptodeira.

Duges (1866) studied a series of specimens which he had collected from Guanajuata, Mexico, and named them *Liophis janii.*

Stejneger (1893) described *H. texana* from specimens collected between Loredo and Comergo, Texas.

In 1895 Günther reviewed the genus and assigned to it the following species. *H. torquatus* Günther (with *ochrorhynchus, chlorophaea, texana* and *janii* as synonyms) *H. discolor* Günther (1860), *H. ornata* Bocourt (1884), and a new species *Hypsiglena latifasciata.* In his remarks concerning the species *H. torquata*, Günther (page 137) had this to say, "Specimens of this species vary in the coloration of the neck, the two principal types of variation having been described as *L. torquata* and *H. ochrorhynchus.*" His brief description of specimens which Boulenger later described as *H. affinis* is also included in his remarks under this species.

The following year (1896), Boulenger reviewed the snakes of the British Museum, probably the same ones studied by Günther in 1895, with the following species listed: *H. ochrorhynchus* Cope, (*H. chlorophaea* Cope, *H. texana* Stejneger, and probably *L. janni* Duges as synonmys) *H. torquata* Günther, *H. discolor* Günther, *H. latifasciata* Günther, *H. ornata* Bocourt, and a new species, *H. affinis* Boulenger.

Mocquard (1889) described *H. venusta* from 5 specimens taken at Santa Rosalia and one from San Ignacio, Lower California and compared them with *H. ochrorhynchus* Cope, and *H. affinis*, all of which he included in the genus.

Cope (1900) considered all nearctic specimens as belonging to one species, *H. ochrorhynchus* Cope. *H. chlorophaea* Cope is listed as a synonym, but *H. texana* Stejneger, and *L. janii* Duges received no consideration.

It is significant that no important taxonomic or morphological comparisons of these genera were made by these early workers. Günther (1895 pp. 137-168) in his arrangement of the genera placed Hypsiglena in Colubridae (Aglyphae) and Leptodeira in Colubridae (Glyphodontes). This is done without any discussion and in spite of the fact that *torquata* was first described as a *Leptodeira.* In describing

torquata (1860) p. 170) Günther calls attention to the smooth fangs and says:

"A character which I should have been glad to admit into the generic diagnosis of Leptodeira was the presence of a posterior grooved tooth; but this character must now fall to the ground, according to my view, the species which I am about to describe exhibiting the posterior tooth smooth, although strong. It is so similar to *Leptodeira annulata* that, at the first glance, one might be tempted to pronounce it merely a variety in which the neck, usually of a light brown colour in *L. annulata*, has become white. The specific difference, however, may be easily proved by a closer examination."

Cope (1900 page 953) in referring to specimens of Hypsiglena says "They are of small size, and resemble considerably the more robust species of Sibon,"[2] yet Cope placed Hypsiglena in the subfamily Coluberinae and Leptodeira in the subfamily dipsadinae.

Van Denburgh (1922) examined about 49 specimens, mostly from Arizona, Southern and Lower California, listing all as belonging to the species *H. ochrorhynchus* Cope.

Dunn (1936) reviewed the genus Leptodeira and united with it the genus Hypsiglena. His study was based upon 957 specimens of which fewer than 20 belonged to Hypsiglena. Of those species previously described as, or placed in the genus Hypsiglena, the following were listed: *Leptodeira torquata* Günther, (*H. affinis* Boulenger as a synonym); *Leptodeira torquata ochrorhynchus* Cope, (*H. chlorophaea* Cope and *H. texana* Stejneger as synonyms); *Leptodeira torquata venusta* (Mocquard), *Leptodeira discolor* Günther, *Leptodeira latifasciata* Günther (*Leptodeira guilleni boulenger* as a synonym).

Dunn brought together a greater number of specimens than had ever been available before. Yet Dunn's report gives little convincing proof that Hypsiglena should be made a part of the genus Leptodeira. Dunn based the uniting of the two genera on the following comparisons:

"Leptodeiras without grooved fangs are usually considered a different genus (Hypsiglena), and by some authors placed in a different subfamily. 'Hypsiglena' consists of the spotted *torquata*, closely similar to *Leptodeira pacificia*; the broad banded *latifasciata*, closely similar to *Leptodeira mystacina* and to *L. nigrofasciata*, and specifically identical with *Leptodeira guilleni*; the narrow banded *discolor*, rather similar to *L. maculata*. Thus I do not believe that the grooveless snakes form a natural group. Furthermore there is no difference save presence or absence of grooves between *Comastes ornata* Bocourt described from Panama, and Panamanian specimens of *Leptodeira annulata*, nor between the Mexican *Hypsiglena latifasciata* and *Leptodeira guilleni*, so that I scarcely consider grooving of specific value in this group. The three so-called Hypsiglena are far more different from each other than they are from various Leptodeiras. In these cases I consider the grooving of the maxillary teeth to have been lost."

In referring to forms as being "closely similar," or "rather simi-

2 Cope did not accept Gunther's use of Leptodeira on the basis that it was a n. n. of Sibon.

lar," it is assumed that he is referring to color patterns. In these genera color patterns overlap each other considerably and when used as key characters will lead to certain confusion, unless other morphological differences are used as the main basis for the separation. The only color pattern worthy of consideration is the lateral spotting. In Leptodeira most species have no lateral spots, a few *bressoni, smithi, splendida*, and *epipitiata* have one row of spots alternating with the blotches. Günther, Cope, Dunn and other workers have called attention to the close similiarities that exists in the color patterns. It is therefore necessary to provide other specific differences if Hypsiglena is to remain as a tenable genus. In Hypsiglena the smooth condition of the fangs is an important trait, in over 400 Hypsiglena studied, none had grooved teeth, while all Leptodeira studied produced grooves. When the anterior maxillary teeth are considered Hypsiglena produces but 8 (average), rarely nine or ten; Leptodeira has ten (10) or more. In Hypsiglena the rostral scute not only protrudes, producing an elongate snout which extends noticeably beyond the mouth, but also wedges in between the internasals and is clearly visible from above; usually measuring from 1–2 mm. in length. Leptodeira have a blunt snout, the rostral does not protrude noticeably beyond the mouth and when seen from above appears as a narrow stripe across the end of the snout; seldom does it exceed one mm. in length. In Hypsiglena the diameter of the eye minus the distance from the orbit to the nasal scute is less than one mm.; in Leptodeira it is one or more mm. Each dorsal scale has one apical pit in Hypsiglena, there are two pits in Leptodeira. The tail is less than 20% of the total length in Hypsiglena, more than 20% (seldom less) in Leptodeira.

Aside from color pattern, these genera are alike in having the same number of dorsal rows (19-21-23) and an overlapping of the ventral and caudal scales.

The failure of earlier workers to recognize that *H. latifaciata* Günther,[3] *H. discolor* Günther and *H. ornata* Bocourt belonged to an entirely different genus and did not represent intermediate species, produced the continual shifting of generic terms.

Taylor (1938) in his notes on the genus Leptodeira not only regards Hypsiglena and Leptodeira as forming two natural groups but proposed a new genus Pseudoleptodeira. To this genus he assigned two species: *Hypsiglena latifasciata* Günther and *Hypsiglena discolor* Günther.

3 Taylor (1938) has also shown that **L. guilleni** is a synonym of **P. latifaciata.**

Taylor's reasons for retaining Hypsiglena are best stated in his own words (1938 p. 318):[4]

"There are present a smaller series of teeth in the jaws; the fangs lack grooves; the elongation of the snout anterior to the mouth is much greater than obtains in typical Leptodeira; the tail is proportionally shorter, and the scales differ in having only a single apical pit instead of paired pits. Moreover, this genus has a distribution north of the Isthmus of Panama, nearly coextensive with Leptodeira. I believe this genus is a natural group worthy of generic recognition."

In Taylor's paper, "Mexican Snakes of the genera Trimorphodon and Hypsiglena," published (1938), the same time as his "Notes on the genus Leptodeira," the following species are listed for Hypsiglena, *H. torquata torquata* Günther, *H. affinis* Boulenger, *Hypsiglena ochrorhynchus* Cope, (*H. chlorophaca* Cope, *Leptodeira torquata venusta* Dunn, and *Hypsiglena texana* Stejenger are synonyms) and a new form, *Hypsiglena torquata dunklei* Taylor is described.

Klauber 1938 reviewed the subspecies of the spotted Night Snake with special reference to *venusta*, validated by Dunn (1936) concluding, "that as far as classification based on ventral scale counts is concerned the subspecies *venusta* is not a tenable form."

Smith (1943) listed the following Mexican species for the United States National Museum, *H. o. ochrorhynchus* Cope, *H. o. janii* (Duges) and *H. torquata* (Günther).

Smith and Taylor (1945) list in their checklist and key to the snakes of Mexico, the following forms: *H. o. ochrorhyncha* Cope, (*H. venusta* Mocquard as a synonym), *H. o. janii* (Duges), *H. affinis* Boulenger, *H. dunklei* Taylor, *H. torquata* (Günther) and *H. slevini* Tanner.

Bogert and Oliver (1945) in their study of the reptiles of Sonora list *ochrorhynchus* as a subspecies of *torquata*.[5] *Dunklei* and *affinis* received no consideration, the new form *H. nuchalatus* Tanner is listed as a subspecies of *torquata*, and *H. slevini* Tanner is listed as a synonym of *venusta*, which they apparently accept as a synonym of *ochrorhynchus*.

My study of the genus dates from 1937, at which time six specimens (all females) from Washington County, Utah, were studied. So noticeable were the increased number of ventrals (193-199) that a comparison was made with specimens collected at Cape San Lucus, Lower California, the type locality of *O. ochrorhynchus*. This study proved to be very inconclusive, but did show the great need for many more specimens from the entire range. Since then many specimens

4 Also pages 367-8.
5 For a further discussion see the remarks under H. torquata.

have been collected, some studied at other museums and a large number received on loan for study. It is now possible to report on 410 specimens which the author considers as belonging to the genus Hypsiglena.

The evidence available does not justify considering Hypsiglena as a synonym of Leptodeira, as proposed by Dunn. The comparisons and studies which have been made, support the same conclusions reached by Dr. Taylor; namely, that each genus represents a natural group of snakes which can be readily distinguished by the characters already listed.

The genus Pseudoleptodeira is more closely related to the genus Leptodeira than it is to Hypsiglena. Its validity rests principally on the smooth fangs, for in other characters it possesses the same characters as or similar to Leptodeira. Pseudoleptodeira are related to Hypsiglena only in that both have smooth fangs. As it now stands we have Leptodeira and Hypsiglena with a closely related intermediate genus which has certain characters common to both genera, but with enough variation to provide for complete separation. The new genus based on the characters found in *P. latifaciata* has clarified the status of these genera.

The present paper contends that Leptodeira, Hypsiglena, and Pseudoleptodeira, are three distinct natural groups of back fanged snakes that may be distinguished as follows:

KEY TO THE GENERA

A. Two apical pits present on each of the dorsal scales; rostral scale scarcely seen from above, rarely measuring more than 1 mm. in length, snout broadly rounded or blunt, not noticeably protruding beyond the mental scute. Diameter of eye minus the distance from the orbit to the nasal scute one or more mm. Tail 20% or more of total length.[6]

B. Fangs smooth, loreal higher than long, at least in *latifaciata;* body with dark bands which involves the edges of the ventrals ..... PSEUDOLEPTODEIRA

BB. Fangs deeply grooved; loreal longer than high, body pattern commonly in spots or if with bands then not involving the ventrals ..... LEPTODEIRA

AA. One apical pit present on each of the dorsal scales. Rostral scale very noticeable from above, measuring more than .9 mm.*; snout rounded or pointed rarely blunt, noticeably protruding

6 Because of the spotted and banded patterns present in these genera no attempt is made to separate on the basis of color pattern. The coloration is of specific value in each genera but is not useful in separating the genera.

* Usable mainly in specimens 300 mm. or more in length.

beyond the mental scute. Posterior superior maxillary teeth (fangs) smooth, less than 10 teeth anterior to the back fangs. Tail less than 20% of total length; eye smaller, its diameter less the distance from the orbit to the nasal scute less than one mm. ..... HYPSIGLENA

THE GENUS PSEUDOLEPTODEIRA Taylor, Pl. II, Fig. 7

Bull. of the Univ. of Kan., Vol. 39 No. 11 1938 p. 343.

GENOTYPE: HYPSIGLENA LATIFASCIATA Günther

Scales in 19-21 (23) rows; head rather broad, the snout not protruding noticeably beyond mouth; nasal divided; loreal present; pupil vertical; anal divided; scales smooth with paired apical pits; two pairs of chin shields; tail relatively long, the subcaudals in two rows, exceeding 60; maxillary teeth about 13-13, increasing in length backward and followed after a short distance by a large fang lacking trace of groove.

REMARKS: The genus Pseudoleptodeira includes a group of snakes which are distinguished by smooth fangs preceded by 10 or more premaxillary teeth and by the paired apical pits in each dorsal scale. Species referred to this genus are represented by only a few specimens in each case. The species *P. latifasciata* (Günther) is represented in collections by six specimens with the following characteristics:

	Sex	Scale rows	Ventrals	Caudals	White bands	Total	Tail	Tail to total length
type latifasciata	F	21	186	80	10	350	78	22.35
type guilleni		23	189	71	11			
USNM 46550	F	23	181	66	12	445	89	20.00
Taylor 5189	F	23	191	69	11	613	124	20.23
Taylor 4658	M	21	188	80	11	525	127	24.19
Taylor 5509	M	21	182	78	13	484	120	24.79

Taylor has referred *H. discolor* Günther to this genus. The scutillation for *discolor* is, 19 scale rows, 7 or 8 upper labials, ventrals 173-178, subcaudals 85-89. The tail is 27.68% of the total length in one specimen.

From the description of *H. ornata* Bocourt given by Boulenger, it seems that this species should also be tentatively referred to this genus. The scutillation for *ornata* is as follows: scaling as in *H. torquata* (probably 21-19-17), 8 upper labials, ventrals 185-189, subcaudals 84-93. Total length (one specimen) 260 mm. tail 87. The tail length is 33.46 per cent of the total length. In both species the characteristics

are strikingly similar to *P. latifasciata* Günther. The high number of caudals and the long tail excludes these forms from the genus Hypsiglena. The presence of smooth fangs excludes them from the genus Leptodeira. Until a study of greater numbers of specimens is made to determine the number of apical pits and other pertinent morphological factors these two species at least *H. ornata,* should be considered only tentatively as belonging to the genus Pseudoleptodeira.

THE GENUS LEPTODEIRA Fitzinger

Fitzinger, Syst, Rept., 1843, p. 27

Type: Annulata

An elongate grooved tooth on the posterior part of the maxillary bone; other teeth subequal. Head plates normal; one loreal. Preanal and subcaudal scuta doubles; scales smooth, with two apical pits, pupil vertical. Hemipenis undivided with bifurcate sulcus separmaticus, and numerous spines below and calyces above. The latter presents a free margin to the superior sinous region, that is, the organ is capitate.

A study of specimens representing five species of Leptodeira shows several other characters which should be added to Cope's description of the genus listed above; they are: snout broad, blunt and not elongated far anterior to the mouth, rostral small, scarcely seen from above, nasal plate short, longer than the distance from the nasal scale to the orbit, 10 or more small maxillary teeth followed after an interspace by one or two large grooved fangs. The eyes are large (larger than in typical Hypsiglena); the diameter of the orbit equal to or greater than the distance to the nostril. Tail long usually more than 20% of the total length, dorsal scales smooth except for a few rows above the vent which are keeled in some species, and with two apical pits. The cephalic plates are normal, there is one loreal usually longer than high, 2 or 3 preoculars, 2 postoculars, temporals normally 1-2-3, upper labials 8 (9) lower labials 10 (11) mental small triangle shape and not dividing the anterior pair of infralabials; two pair of equal or subequal geneals; ventrals normal, ranging from 150 to well over 200 scutes; 60 or more subcaudals.

THE GENUS HYPSIGLENA Cope

Leptodeira (part). Günther, Ann. Mag. Nat. Hist. (3), v. 1860, p. 170.

Hypsiglena Cope, Proc. Acad. Nat. Sci. Philadelphia, June, 1860,

page 246.

(Generic description: type ochrorhynchus).

Pseudodipsas Peters, Monatsb. Akad. Wiss. Berlin, 1860, p. 521.

Comastes Jan, Elenco Sist. Ofic., 1863, p. 102.

DESCRIPTION OF THE GENUS

Head

Size and Proportions: The head is normally flattened across the parietals and between the eyes, but rounded anteriorly; snout moderately pointed, except in *slevini* which is blunt. In most adult specimens the head is noticeably wider than the neck.

Scutellation: The cephalic plates are normal, consisting of paired parietals, prefrontals, internasals, and supraoculars, and with a single frontal. The rostral protrudes, except in *slevini*; nostril between two nasal scales; loreal single except for *lorealus* and *unaocularis*. There are two preoculars, except in *affinis*, which has but one; the eye is small to moderate, large in *slevini*, and eliptical. There are two postoculars, followed by a large temporal which is normally followed by two (rarely by three) smaller scales. The supralabials are 7 or 8 rarely 9, infralabials normally 10, except for *dunklei* where there are 11, rarely 9. Mental wedging part way between the first pair of labials, completely dividing them in some specimens of *nuchulatus* and *torquatus*, which meet on the midventral line. There are two pair of equal or subequal genials.

Color Pattern: The head and nape is variously colored, *torquata, dunklei*, and *affinis* all have light cream colored bands across the nape followed by a large dark nuchal blotch. *Nuchalatus* and *janii* have no light band but a large dark nuchal blotch across the nape; other forms are variously spotted across the nape. The dark nuchal blotch, or the lateral spots, extend anterior to the eye, divided posterior to the labials in most *klauberi*. Under parts normally immaculate except for the genials and gulars which are flecked with small spots.

Dentition: There are 7-10, subequal superior maxillary teeth, followed after a space by one or two smooth fang-like teeth. The normal complement of anterior maxillary teeth is 8; in specimens in which fewer than 8 teeth are found, there are usually spaces between some of the teeth and an empty socket or broken tooth on the jaw bone.

Body and Tail

Proportions: The body is cyclindrical, and ranging in length

from 151 to 642 mm. The tail is short, making from 12 to 20 per cent of the total length, in adult males the tail makes up a greater per cent of the total length and is more plump behind the anus; in females it tapers noticeably and is proportionately shorter.

Scutellation: Body scales smooth, except those above the vent, which are, in most males and a few females, keeled or with small knobs. There are from 19 to 23 longitudinal rows of dorsal scales near the middle of the body, with 1-3 reductions before the vent. The reductions occur by combining two lateral rows of dorsal scales, usually the 3-4, 4-5 or the 5-6 lateral rows. This may be expressed by the following diagram:

	120		135		152	.....	Ventrals
4		4		3		.....	Lateral Rows
21 –	19	–	17	–	15	.....	D. Scale Rows
5		5		4			
	121		136		155		

The first row of dorsal scales is slightly larger than the other dorsal rows. There is a single apical pit on each of the dorsals. On the abdomen is a single row of transverse ventral plates, which vary in number from 154-204. Immediately posterior to the ventrals is an obliquely divided anal plate. The caudals are in two rows and range from 36-68 pair, with an occasional pair of scales united. There is considerable variation in the number of ventrals and caudals between male and female specimens; the females have high ventral and low caudal counts while the males have lower ventral and higher caudal counts.

Color Pattern: The color pattern above is one of spots separated by irregular bands of light colored scales; the spots are arranged in a median series with some of the spots of nearly every specimen suggesting a division into two rows. This condition does occur in *o. venusta*. The spots may be large or small, dark or light colored. Lateral to the large spots are two or three series of smaller spots alternating with the larger dorsal spots and each other. Ventrals and caudals may or may not be flecked with small spots.

Habits and Habitat: The snakes belonging to this genus are very secretive, and move mainly at night. They are apparently adapted to rocky foot hill regions and while they have been called "night snakes" they might well be called "rock snakes." Records indicate that all lay eggs, presumably in late spring or early summer, although this is not certain for any species. The food consists, at least in part,

of small lizards, (Uta, Sceloparus) amphibia (Bufo) and insects, mainly beetles. Hypsiglena are gentle to handle; I know of no instance in which one has attempted to bite man. They are, however, quite intolerant, at times, towards small lizards. Their bite is not immediately effective as in some forms but may after a short time prove fatal. Feeding has been observed but once, at which time a *Uta stansburana stansburana* B. & G. was eaten. It was swallowed head first and required about ten minutes. Considerable data must be gathered before we will understand the habits of these snakes.

Range: The genus Hypsiglena is distributed throughout Mexico and parts of Central America. The limits of its southern range is not as yet well defined. In the United States it has been found in the following states: Texas, Oklahoma, Kansas, Colorado, New Mexico, Arizona, Utah, Idaho, Washington, Oregon, Nevada, California and in Lower California with its adjoining islands. A single specimen has also been collected on Clarin Island 400 miles off the tip of Lower California.

Variation: The variation in the number of ventrals is considerable in most species, overlapping into related groups to such a degree that classification based on ventral variation would lead to confusion. This is particularly true of *ochrorhynchus* and its sub-species. Ventral variations should not, however, be entirely discorded from classification keys, but should be used in connection with other characteristics in determining the specific status of any specimen.

Synonymy Chart for the Genera Hypsiglena, Leptodeira and Pseudoleptodeira

Names of Authors		Generic Terms Used by Authors		
		Leptodeira	Hypsiglena	Pseudoleptodeira
Linnaeus	(1758)	Coluber	Coluber	Coluber
Fitzinger	(1828)	Sibon	Sibon	Sibon
Fitzinger	(1843)	Leptodeira	Leptodeira	Leptodeira
Günther	(1860)	Leptodeira	Leptodeira	Leptodeira
Cope	(1860)	Leptodeira	Hypsiglena	Hypsiglena
Günther	(1894)	Leptodeira	Hypsiglena	Hypsiglena
Boulenger	(1896)	Leptodeira	Hypsiglena	Hypsiglena
Cope	(1900)	Sibon	Hypsiglena	Hypsiglena
Dunn	(1936)	Leptodeira	Leptodeira	Leptodeira
Taylor	(1938)	Leptodeira	Hypsiglena	Pseudoleptodeira

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MUSEUM AND COLLECTOR ABBREVIATIONS

The following is a list of the abbreviations of museums and collections referred to in this study: American Museum National History, A. M.; Brigham Young University, B. Y. U.; California Academy of Science, C. A. S.; Chicago Academy of Science, Ch. A. S.; Carnegie

Museum, C. M.; Cornell University, Cornell; College of Puget Sound, C. P. S.; Dixie College, D. C.; Edward H. Taylor, E. H. T.; Fields Museum of Natural History, F. M.; Idaho State Museum, I. S. M.; Laurence M. Klauber, L. M. K.; Museum of Comparative Zoology, M. C. Z.; Michigan Museum of Zoology, M. M. Z.; Ross Hardy Collection, R. H.; Rochester University, R. U.; Stanley Muliak, S. M.; Stanford University, S. U.; University of Arizona, U. A.; University of California, U. C.; University of Oklahoma, U. O.; United States National Museum, U. S. N. M.; University of Utah, U. U.; University of Washington, U. W.; Zion Canyon National Park, Z. N. P.

THE DISPOSITION OF THE TYPES OF THE GENUS HYPSIGLENA

Günther named the species *torquatus* from two specimens collected in Nicaragua, with one coming from the Island of Laguna. From the literature it now appears that the specimen taken on the Island of Laguna is in the British Museum, and the other is in the Derby Museum, Liverpool, England.

The types for *affinis* are in the British Museum, London.

The type for *dunklei* is in the museum of Comparative Zoology, Cambridge, Mass., No. 42594.

The type for *slevini* is at the California Academy of Science, No. 53631.

The types of *o. ochrorhynchus* are located in three museums. Dr. Doris M. Cochran reports that the following specimens are in the National Museum No. 5283 (four specimens) listed as cotypes; all in fairly good condition. A single specimen No. 9216, considered by Dr. Stejneger as a possible paratype, and three specimens Nos. 69538-40 are also listed as paratypes. Dunn 1936 and Smith and Taylor 1945 list only one specimen No. 4676 for the National Museum. They list two specimens Nos. 3748-9 for the Academy of Natural Science at Philadelphia. Smith and Taylor list four cotypes No. 9503 for Museum of Comparative Zoology. If we can believe these figures, there are in existence twelve type specimens.

The location of the type of *o. janii* is unknown. Dr. Duges sent, in a shipment of reptiles from Mexico, two specimens of *janii Nos.* 9889 and 11369 to the U. S. National Museum. Whether these could represent type specimens is also unknown. They were, however, collected from the type locality by the author of the subspecies.

Six types of *o. venusta* are in the Paris Museum.

The type of *o. texana* is in the U. S. National Museum, No. 1782.

The type of *o. nuchalatus* is at the Brigham Young University, No. 3008. There are paratypes at California Academy of Science, No. 30876; University of California, Nos. 19328-30, 19207, 2476, 27487, 28202, 20505, 24118, 20486; Stanford University, No. 8070; and in the collection of L. M. K. Nos. 20233, 20293, and 22501.

The type No. 2836 of *o. deserticola* is at the B. Y. U. The paratypes have been distributed as follows: No. 92327 is at the M. M. Z.; B. Y. U. No. 2198 is at the U. S. National Museum; B. Y. U. No. 2196 is at the University of Utah; ten other paratypes Nos. 640, 2126-8, 2026, 2709, 7937-8, 8011, and 2197 are at the B. Y. U.; and B. Y. U. No. 8014 is retained in the author's collection.

The type No. 2829 and one paratype No. 2192 of *o. lorealus* is at the B. Y. U.; four paratypes are in the Ross Hardy Collection at Dixie College, St. George, Ut., and one No. 68595 is in the Mich. Mus. of Zoology.

The type of *o. klauberi* is in the L. M. K. collection, No. 20228. There are two paratypes Stanford U. No. 6678 and Calif. Acad. Sci. No. 13602.

The type of *o. tortugaensis* is in the Calif. Acad. Sci. No. 51460. There is one paratype in the L. M. K. collection No. 4070.

The single type of *o. unaocularis* is at the American Mus. Nat. Hist. No. 62756.

KEY TO THE SPECIES AND SUBSPECIES OF HYPSIGLENA

A. Dorsal scales in 19-19-17-15 rows (at least 19 rows at the 100th ventral. supralabials 7-7.

B. Ventral count low 162-168; preoculars 1-1; nape with a light nuchal band. .....*H. affinis* Boulenger

BB. Ventral count high 179-201, preoculars 2-2, nape without a light nuchal band but with a dark nuchal blotch.....*H. o. nuchalatus* W. Tanner

AA. Dorsal scales in 21 or more rows at the middle of the body; supralabials usually 8-8, rarely less.

B. Dorsal scales in 23 rows at or near the middle of the body; diameter of the orbit greater than the distance from the orbit to the nostril; parietals in contact with the lower postoculars.....*H. slevini* W. Tanner

BB. Dorsal scales in 21 rows at the middle of the body; diameter of the orbit equal to or less than the distance from the orbit to the nostril; parietals not in contact with the lower postoculars.

C. Nape with a light nuchal band 4-5 scales across not or rarely interrupted medially or laterally, and followed by a large nuchal blotch.

D. Rostral large pushing far between the prefrontals, the part visible above

equal to three-fourths the distance between the rostral and frontal; 8 supralabials, 11 infralabials; subcaudals 57 (in one male).....*H. dunklei* Taylor

DD. Rostral not pushing far between the prefrontals, part visible above equal to or less than one-half the distance from the rostral to the frontal; 7 or 8 supralabials; subcaudals 38-47.....*H. torquatus* Günther

CC. Nape without a light nuchal band; nape variously blotched, that is spotted or with a single blotch covering the nape.

D. Loreals 2-2.

E. Postoculars 1-1; scales between the dorsal spots pigmented the same as those scales lateral to the dorsal spots.—(Plate III, Fig. 4 & 5).....
.....*H. o. unaocularus* W. Tanner subsp. nov.

EE. Postoculars 2-2; scales between the dorsal spots distinctly lighter in color than those scales lateral to the spots.—(Plate II, Fig. 1).....
.....*H. o. loreatus* W. Tanner subsp. nov.

DD. Loreals 1-1, rarely more, but when present small.

E. The dorsal rows of spots separated by a lighter median stripe varying from a scale or less in width; dorsal spots small involving 4-5 scales and occupying a space of 2 or 3 scales. The first lateral row of spots separated from the dorsal row by at least one row of scales; ventrals 174-190.—(Plate III, Fig. 7).....*H. o. venusta* Mocquard

EE. The two dorsal rows of spots rarely separated, often a few are alternating; spots larger, involving 7 or more scales and occupying a space of 4 or more scales.

F. Nape with three distinct spots, two lateral and one medial, the medial spot is occasionally divided near the middle, but is always in contact with the parietals, or the scale immediately posterior to the parietals.

G. Medial nape spot greatly enlarged posteriorly, the anterior part narrow, 1-3 scales wide, and extending back from the parietal 4-7 scales, where it immediately enlarges to cover nearly all of the nape; lateral nape spots complete and extending anteriorly at least to the eye; ventral-caudal totals 229-261; rarely more than 16 dorsal rows at the vent.....
.....*H. o. deserticola* W. Tanner subsp. nov.

GG. Medial nape spot uniform, or nearly so, for its entire distance (varying only a scale or so in width).

H. Ventral-caudal total 245 or more, caudals high, 57-59 in two females, medial nape spot 12 scale long or more...*H. o. tortugaensis* W. Tanner subsp. nov.

HH. Ventral-caudal total rarely more than 240. Caudals in female 54 or less, in males up to 60.

I. Dorsal spots extending from the 7th to the 15th scale row and each spot when complete involving 22 or more scales. Each spot is separated by a distance equal to one scale or less, usually about ½ scale. The first row of lateral spots large involving 6 or more scales and extending from the 4th to the 7th or 8th row. Top of head usually rounded, 6th supralabials about half pigmented. Dorsal scales rarely less than 17 rows at the vent. Ventrals 154-177. Lateral nape spots complete.....*H. o. texana* Stejneger

H. Dorsal spots smaller, usually extending from the 8th to the 14th rows. Spots involving fewer than 22 scales, lateral spots smaller, distance between the dorsal and lateral spots one scale row or more. Top of head usually flattened, 6th supralabial less than half pigmented, ventrals 161-188.....
.....*H. o. ochrorhynchus* Cope

HH. Nape with three distinct spots, the medial spot two or more scales posterior to the parietals, lateral nape spots divided at the angle of the mouth or posterior to it; dorsal scales in 17 or 15 rows at the vent.....
.....*H. o. klauberi* Tanner subsp. nov.

HHH. Nape without three distinct spots but with two spots or a nuchal blotch which extends entirely across the neck region.

G. Nape with a narrow band 1-6 scales across or with only two nape spots; dorsal spots, medium to small, usually involving less than 21 scales, and one or more scales apart; dorsal scales at the vent 17 or 15 rows.....
.....*H. o. ochrorhynchus* cope

GG. Nape with a distinct, long nuchal band, 7-10 scale lengths. Spots large involving 21 or more scales and less than one scale apart; 17 scale rows at the vent. Ventrals 162-173, caudals 39-55.....*H. o. janii* Duges

HYPSIGLENA TORQUATA (Günther) Pl. II, Fig. 9; Pl. III, Fig. I

Leptodeira torquata Günther, Ann. Mag. Nat. Hist. (3), V. Feb. 1860, p. 170, pl. 0, fig. A (type description: type locality, Laguna I., Nicaragua); trooschal. in Muller, Reisen in den Vereinigten Staaten, Canada and Mexico, III, 1865, p. 612.

Leptodeira t. torquata Dunn, Proc. Nat. Acad. Sci., 22, No. 12, 1936, pp. 689-698. Bogart and Oliver, Amer Mus. Nat. Hist. Vol. 83 Art. 6. 1945, pp. 378-81.

Pseudodipas fallax Peters, Monatsb, Akad. Wiss. Berlin, 1860, p. 520.

Comastes quincunciatus Jan, Elenco Sist. Ofid., 1863, p. 102, and Icon. Gen. Ofid., 38, 1871, pl. 1, fig. 1. ("Maxatlan," "Costa Rica," "Caracas," "Mexico"); Tooschel, in Muller, Reisen in Den Vereinigten Staaten, Canada and Mexico, III, 865, p. 612.

Hypsiglena torquata Cope, Bull. U.S.N.M., No. 32, 1887, p. 78; Günther, Biologia Centrali-Americana, Rept. Batr., Oct., 1895, p. 137 (part.); Boulenger, Cat. Snakes British Mus., II, 1894, p. 210, 359 (Ventans, Durango; Presidio, near Maxatlan, Sin.; Nicaragua); Gadow, Proc. Zool. Soc. London, June 6, 1905, pp. 224, 241; Mocquard, Mission Scientifique au Mexique et dans l'Amerique Centrale, Reptiles, livr. 16, 1908, pp. 867, 868 (part) figs. 3 (?); Werner, Zool. Zahrb., 47, 1929, pp. 124, 125; Smith, Proceedings of the Nat. Mus., Vol. 93, No. 3169, 1943, p. 433; Smith and Taylor, Proc. of the U. S. Nat. Mus., Bull. 187, p. 74.

Hypsiglena torquata torquata Taylor, Bull. of the Univ. of Kansas, Vol. 25, June 1, 1939, pp. 371-73; Some Mexican Serpents, Univ. Kansas Sci. Bull., Vol. 26 p. 467-469.

General Description

The following description is based on 10 specimens which I have examined and upon the description of the type specimen.

Head

Size and Proportion: The head is moderately long, broad and somewhat truncate in shape. The parietal and frontal regions are flat,

TABLE I. SPECIES VARIATIONS IN THE GENUS HYPSIGLENA

Species	Sex	No. of Specimen	Scale Rows	Ventrals	Caudals	Labials Supra	Labials Infra	No. of Spots	Longest Specimen	Nape Pattern
torquata	♂	3(1)	21-19-17	159-166 (161)	42-47 (45)	7 or 8	9 or 10	45-48 (47)	352	two bands
	♀	8(1)		164-174 (169)	36-41 (38)			48-56 (51)	460	
affinis	♂	1(2)	19-17-15	162-164 (163)	43-51 (47)	7-7	10-10	43	310	two bands
	♀	(1)		168	39					
dunklei	♂	1	21-19-17	162	57	8-8	11-11	43	373	two bands
ochrorhynchus	♂	206	21-19-17-415	154-195 (177)	45-66 (50)	8-8	10-10	39-75 (53.6)	479	one band or 3 spots
	♀	185		162-204 (185)	38-47 (46)			38-95 (57.7)	642	
slevini	♂	1	21-23-21-19-17-15	190	68	8-8	10-10	52	217	five spots

TABLE II. VARIATIONS IN THE SUBSPECIES OF THE SPECIES OCHRORHYNCHUS

Subspecies	Sex	No. of Specimen	Scale Rows	Ventrals	Caudals	Ventrals and Caudals	Supralabials	Loreals	% of V-C above or below 235		% of Dorsal Rows Reducing to:		% of Pop. with a dark nuchal band	% of Pop. with a complete lateral stripe
									Below	Above	15 rows	17		
janii	♂	2	21-19-17	162-163.5-165	51-53-55	213-216-220	7 or 8	1-1	100			100	100	100
	♀	3	21-19-17	167-170-173	39-41-45	210-211-212	7 or 8	1-1	100			100		
texana	♂	11	21-19-17	154-167.5-173	45-50-55	206-216-224	8-8	1-1	100		36	64	7	100
	♀	18	21-19-17	162-172-181	38-42-47	201-214-225	8-8	1-1	100		0	100		
ochrorhynchus*	♂	57	21-19-17-15	166-174-188	46-55-66	218-227-245	8-8	1-1	69	35	84	16	34	81
	♀	45	21-19-17-(15)	168-178-191	42-47-54	215-225-241	8-8	1-1	63	37	52	48		
deserticola	♂	62	21-19-17-15	177-184.7-194	49-57-66	231-241-256	8-8	1-1	8.7	91.3	93	7	6	96
	♀	42	21-19-17-15	186-193.6-204	42-52-57	233-243-261	8-8	1-1	2.5	97.5	72	28		
lorealus	♂	4	21-19-17-15	183-186.5-189	54-55-57	237-242-246	8-8	2-2		100	100		22	89
	♀	5	21-19-17-15	187-193.8-202	47-49-52	239-243-250	8-8	2-2		100	80	20		
nuchalatus	♂	11	21-19-17-15	179-185-191	47-50-53	226-234.6-243	7-7(8)	1-1	36	64	100	0	100	100
	♀	5	21-19-17-15	195-198-201	42-44.5-46	237-242-246	7-7(8)	1-1		100	100			
klauberi	♂	58	21-19-17-15	161-173-182	46-50-56	216-227-234	8-8	1-1	96	4.0	86.5	13.5	9	3.3
	♀	56	21-19-17-(15)	173-182-189	39-44-49	207-223-236	8-8	1-1	100		37	63		
venusta	♂	2	21-19-17-15	176-180-184	54-55-56	232-235-238	8-8	1-1	50	50	100		33	100
	♀	7	21-19-17-15	174-184-190	48-50-52	224-234-239	8-8	1-1	71	29	86	14		
tortugaensis	♂	2	21-19-17	190-187	57-59	246-247	8-8	1-1		100		100	0	100
unaocularus	♀	1	21-19-17-15	184	59 tip missing	243	8-8	2-2		100	100		0	...

* Some Arizona specimens produce high ventral counts while Sonoran specimens produce high caudal counts.

the internasals and prefrontals broadly convex. The ten specimens have head lengths varying from 8.2–15.3 mm., ave., 12.78. The head width range from 5.3 to 11 mm. The greatest width occurs immediately back of the eye and is maintained for some distance back of the eye where it gradually lessens in the neck region.

Scutellation: The rostral is distinct from above and only slightly wedged between the internasals. There are two internasals, prefrontals, parietals and supraoculars, and one frontal all normal. The scale is divided with the nostril situated just anterior to the center and nearer to the internasal than to the first upper labial. The loreal is as high as long or nearly so, and in contact with the lower preocular in all but one specimen examined; these two characters are rarely found in other forms of this genus. There are two subequal preoculars the lower scale much smaller, two nearly equal postoculars, the dorsal scale usually a little larger. The eye is medium varying from 1.2–2.2 mm. in diameter, its diameter equal to one-half of the interorbital space or greater. The distance from the orbit to the nostril is about equal to the distance from the rostral to the frontal plate. The temporals are normally 1-2-2, occasionally 2-2-3. The labials are variable, twenty counts (ten specimens) show seven with 7 upper labials, the remainder having 8. The lower labials show eleven counts with 9, and the remainder with 10. When there are but seven upper labials the 3-4th enter orbit, but when eight are present the 4-5th enter the orbit; in the specimens having 7 on one side and 8 on the other it is the second labial which has or has not divided. In the lower labials it is the third scale which divided to produce 10 scales or remains single to produce 9 scales. The mental scale is wedge-shaped, and in most specimens elongated dividing the first pair of labials, in all but one specimen, F. M. 39092 in which the division is neary complete, genials equal or subequal. The posterior genials are divided by gulars in 8 of the 10 specimens examined.

Color Pattern: The cephalic plates are dark, mottled with light flecks and markings although it may be almost entirely a blue slate color; extending from the eye back across the lower postocular and the labials is a dark stripe, above and below which is a smaller light stripe. The labials, genials and gulars are margined and flecked with dark markings. Across the posterior part of the head and on the nape are two nuchal blotches or bands; the anterior band is a light cream color and extends laterally to the second or third row of scales above the ventrals. At the median this light band is about 4 scales across, but is less than two near its lower points. In most specimens a dark

stripe, about a scale wide, extends from the parietals part way across the light band, but rarely bisecting it. The dark nuchal blotch is 4-5 scales wide at the median and becoming wider laterally. It terminates on or before the second row of dorsal scales.

Body and Tail

Proportion and Size: The body is round, moderately thick and with but little tapering before the tail. Total lengths (see table I) suggest a species of average to large size as compared with other forms.

Scutellation: The dorsal scales are smooth with the exception of an occasional specimen (usually a male) with keeled or knobed scales above the anus, and in 21-21-19-17 (rarely 15 or 18 at the vent) longitudinal rows. The reduction to 19 rows occurs from the 101st to the 118th ventrals, and involves usually, the 4-5th lateral rows of scales; the reduction to 17 rows may occur anywhere from the 121st to the 143 ventrals. The ventrals (159-171) and caudals (36-47) are few when compared with other forms in the genus.

Coloration: Posterior to the nuchal blotch is a median series of large spots, some are complete others are partly or completely divided: those partly or entirely divided tend to divide on the median and there are usually 3 to 5 groups of these divided or dividing spots along the back. The spots are moderately large involving from 15 to 20 scales or more in a few cases, each spot is 2–3 scales long and extend from the 8th to the 14th rows; the spots are separated by an irregular light bar less than one scale across. Lateral to the median spots are two rows of smaller spots which alternate with the median spots and each other. These spots are on the 2-3 and 5-6 dorsal rows. The scales to the side of the dorsal spots and between the lateral spots are heavily pigmented in most specimens, this reduces the emphasis of the spotting so characteristic of the genus. The ventrals are cream color except on the edges where they are flanked with fine spots. The tail in most specimens is heavily and quite uniformly pigmented, there being little chance to determine more than a few of the more anterior spots. Caudals colored the same as the ventrals.

Diagnosis: The chief characteristics of this species are the two nuchal bands, the anterior one cream colored, 4-5 scales across, the second one dark and 4-5 scales across, the dorsal scales reduce to only 17 rows at the vent and there are a reduced number of ventral and caudal scutes; the total caudal count does not exceed 215 scales. Other important differences are: a nearly square loreal, posterior genials

divided by 1-2 gulars; mental dividing, or nearly so, the 1st pair of infralabials on the midventral line; 35% of the counts show but 7 supralabials, and 55% of the counts show 9 infralabials.

RANGE: It is known from Costa Rica north to Morelos, Michoacan and Colima Mexico. I have seen only Mexican specimens.

MATERIAL: Morelos, near Huajinlan, E. H. T. Nos. 5200-1, 5561-4 and 23476; Guerrero, near Naranjo, E. H. T. 23477 and 29806; Michoacan, Apatzingon, F. M. 39092. Colina U. S. N. M. 31385.

RELATIONSHIPS AND VARIATIONS: An interpretation of the relationships of *torquatus* to other members of the genus must await the collecting of many more specimens from states north of Colima and Michoacon. The few specimens collected, some of which I have not been privileged to see, are so variable as to produce a confused picture. Two specimens in a series of Hypsiglena from Sonora have distinct light nuchal bands as well as the dark band, but in other respects there are few resemblances. The dorsals reduce to 15 rows before the vent while in *torquatus* there are none that reduce before the vent. *Torquatus* has 215 or less ventral-caudal scutes while forms from Sonora produce 223 or more with an average of 235 scutes. In *torquatus* the gulars (1 or 2) completely divide the posterior genials, a condition seldom encountered in any other form. Furthermore, the mental scute is elongated and divides the first pair of infralabials in most specimens.

To include *ochrorhynchus* as a variety of *torquatus* on the basis of nuchal bands alone would be a hazardous guess at this time. There may well be a close relationship between these two forms but as yet it cannot be established with any degree of certainty. The dissimilarities, both in structure and color, stand out when a series of each species is studied together.[7]

7. Since this study was finished a report by C. M. Bogert and James A. Oliver (1945 pp. 378-381) presents a series of conclusions regarding the status of the **torquata-ochrorhynchus** complex. They accept Dunn's (1936) uniting of **ochrorrhynchus** with **torquata** and base their conclusions primarily on two specimens with light nuchal bands which were collected with four other specimens at Guirocoba and a single specimen from Alamos, Sonora. A series of seven specimens from Colima, Nayarit and Sinaloa, Mexico are also listed. The Sonoran series I have seen, the others I have not. They are listed as having the **torquata nape pattern,** but as resembling **ochrorhynchus** in the number of labials. It is suggested that the ventrals increase from south to north.

Such a change based on our limited data is not as yet advisable because (1) the ventral-caudal totals are more reliable than ventrals or caudals listed alone, and these do not overlap in the Sonoran and more southern forms. (2) The nature of the mental scute must be examined. (3) The posterior genials are divided by gulars, or nearly so, in all **torquata** examined, none are divided in Sonoran forms. (4) The reduction to 15 dorsal scales does not occur in **torquata** specimens, it does in all of the 12 available Sonoran specimens. (5) The head is broad in **torquata,** that is, the interorbital space is twice or more the diameter of the eye, less in **ochrorhynchus**. (6) Three rows of lateral spots in **Sonoran ochrorhynchus** usually two in **torquata**.

It is quite possible that more collecting may produce enough evidence to justify the uniting of **ochrorhynchus** with **torquata**. In fact I consider this to be a real probability. But as yet enough data is not at hand, and such a procedure would provide us with an unreal conclusion.

HYPSIGLENA AFFINIS Boulenger, Pl. II, Figs. 2 and 6

Hypsiglena torquata Günther, Biologia Centrali-Americana, Rept. Batr., Oct. 1894. p. 137 (part).

Hypsiglena affinis Boulenger, Cat. Snakes British Mus., II, 1894, pp. 210, 211, pl. 8 (type description; type locality Zacatecas and Jaliisco) Mocquard, Bull. Soc. Phil. Pairs, (9), I, No. 4, 1899, p. 157 (Guadalajara); and Mission Scientifique au Mexique et dans l'Amerique Centrale, Rept. Livr. 16, 1908, pp. 868-869, pl. 69, figs. 2, 2a, 2c, (Mexico); Werner, Zool. Jahrb, 57, 1929, pp. 124, 125 (Key); Taylor, Bull. of the Univ. of Kansas, Vol. 25 June 1, 1938, p. 370-71 Smith, proceedings of the Nat. Mus., Vol. 93, no. 3169, 1943, p. 433. Smith and Taylor, proceedings of the Nat. Mus., Bull. 187, p. 73.

Leptodaira torquatus torquatus Dumn., Proc. Nat. Acad. Sci., 22, 1936 (part).

Description

The following description is based on the brief description given by Günther and Boulenger, and on a single male specimen No. 4601, collected by H. M. Smith and now in the E. H. Taylor collection. I have examined this later specimen and find it distinct from other forms studied.

Head

The head is long (11.2 mm) and moderately wide (7.6), its shape resembling that of other forms, but with less pronounced swelling in the temporal regions, where the greatest width occurs. (This may be due to the small specimen although Boulenger reports one nearly as small as the one at hand, it may therefore be a species characteristic.) and an immediate, though gradual lessening in width to the neck region. The head is distinct from the body but not prominently so.

Scutellation: Rostral as seen from above, .8 mm long, only slightly wedging between the internasals; rostral to frontal 2.3 mm.; diameter of orbit less than half the interorbital space; other cephalic plates normal, the parietals largest. The nasal scale is divided with the nostril situated more in the anterior half and is very nearly an equal distance from the labial and the internasal. The loreal is noticeably longer than high. Only one large preocular, but with two subequal postoculars the dorsal scale twice the size of the lower. The eye is moderate with a diameter of 1.7 mm., orbit to nostril 2.0 mm. The temporals are 1-2-3. Upper labials 7-7, but possibly some with 8; the 3-4 labials enter the orbit and the 5th is the largest. The lower labials are 10-10. The mental scale is triangle shaped and does not divide the first pair of lower labials which meet on the mid-ventral line. There are two pair of genials, the first pair is the larger.

Color Pattern: The cephalic plates are buff-brown mottled and flecked with lighter colors; a dark stripe extends posterior from the

eye across the labials where it terminates; above and below it are small faint light stripes. The labials, genials and gulars are variously margined and flecked with pigment. Posterior to the parietals are two nuchal cross bands. The first one is a light cream colored band 5-6 scales across at the median, and extending laterally to the 4th dorsal row where it narrows to 3 scales in width. Following and adjoining the light band is the dark brown nuchal band which is 6-8 scales across and extends laterally to the third row of dorsal scales. The dark blotch is narrower medially and wider laterally.

Body and Tail

Size and Proportion: The body is small and slowly tapering from the posterior part of the body to the vent. The tail is short to moderate; in two specimens the tail averaged 16% of the total length. The specimen at hand measures 288 mm. total length with a tail length of 46 mm.

Scutellation: The dorsal scales are smooth, except for a few rows above the vent, and each scale has but one apical pit. There are 19-19-17-15 longitudinal rows, with the reduction to 17 rows occurring at the 113th ventral by combining the 4-5 lateral rows. The reduction to 15 occurs at the 137th ventral. There are 162 ventrals and 46 caudals. Boulenger lists three specimens with the following ventral and caudal counts, 164, 168, 162; 43, 39, and 51.

Coloration: Extending from the nuchal blotch is a median series of large spots some of which have partly or entirely divided on the median line. The spots are moderate in size and usually involve fewer than 20 scales, the spots are 2-2½ scales long and divided by a light stripe one scale across. The spots extend from the 6th to the 13th rows. Lateral to the median spots are three smaller rows alternating with the dorsal spots and each other, the scales not involved in the spots are light brown; the spots are dark brown. The ventrals and caudals are white.

Diagnosis: A species of Hypsiglena producing only one preocular; seven labials and only 19 dorsal rows of scales.

Range: Known only from the type locality Zacatecas and Jalisco, Mexico.

Relationship and Variations: On the basis of the one specimen examined and the three reported by Boulenger in his original description, *affinis* is related to *torquatus* only in that it resembles it in coloration. The spots are smaller and more numerous and the nape bands are more extensive than in typical *torquatus*.

HYPSIGLENA DUNKLEI Taylor

Leptodeira torquata Dunkle and Smith, Notes on some Mexican Ophidians Occ. Papers of the Mus. of Zool., Univ. of Mich., Dec. 16, 1937, No. 363, pp. 10-11.

Hypsiglena torquata dunklei Taylor, Mexican Snakes, Bull. Univ. Kan. Vol. 39 No. 11 June 1, 1938, pp. 374.

General Description

It has not been my privilege to study the type specimen (MCZ No. 42594) of this unique species and since there are no other specimens available I am including only the diagnosis as given by Dr. Taylor in the original description (1938 p. 374).

Hypsiglena dunklei Smith and Taylor, Proc. Nat. Mus., Bull. 187, p. 73.

"The most northern variant of *Hypsiglena torquata,* varying in the following characters from the typical form: rostral bent far back over the snout, which is somewhat compressed (wedgelike) rather than rounded; the length of the part visible above more than three fourths its distance from the frontal; prefrontals subtriangular, rather than square, due to the fact that the rostral enter between them, reducing the length of the suture between them; posterior chin shields largest; lower labials, 11-11; loreal irregularly shaped, not square; ventrals, 162, subcaudals, 57; males with tubercular knobs on scales on side above anus; vertical diameter of eye minutely less than one-half of the interorbital distance."

Range: Known only from the type locality, Hda. L. Clementina, near Forlon, Tamaulipas, Mexico.

Remarks: In comparing the original description of *dunklei* with other forms of Hypsiglena, I have found it to be so distinct as to warrant full species status. That it is in some respects related to *torquatus* is evident from the color pattern, but the scutellation resembles closely that of *janii* except for the 11-11 labials. Its distinctiveness lies in the greatly elongated rostral. Out of the large series of Hypsiglena studied I have yet to find a specimen with a rostral longer than wide as in the case of *dunklei.* The enlarged rostral, increased number of lower labials, the high caudal count and the presence of the light nuchal band plus the fact that it is geographically isolated from other Mexican forms, warrant its elevation to a full species instead of a subspecies of *torquatus.*

HYPSIGLENA O. JANII (Duges), Pl. II, Fig. 5

Liophis janii Duges, Mem. Ac. Montpelier, VI. 1866, Proc.-Verb. p. 32 (fide Boulenger).

Hypsiglena t. torquata Taylor. Univ. of Kansas Bull. Vol. 25, p. 371, 1939.

Hypsiglena o. janii Smith, Proc. U. S. Nat. Mus. Vol. 93, p. 433, 1943; Smith and Taylor, U. S. Nat. Bull. 187, p. 74, 1945.

General Description

The following description is taken from 5 specimens USNM Nos. 46513 Tutataro Michoacan, 9889 and 11369, collected by Dr. A. Duges and may represent type material since they were collected from Guanajuato, Guanajuato, Mexico, the type locality for *janii;* USNM. 46444 and MMZ. No. 77243, Rio Verde and San Luis Pososi, San Luis Potosi, Mexico. The description is taken from the later specimen since it is an adult female with the figures in bracks referring to No. 11369 a small male.

Head

Size and Proportions: The head is longer than broad, the width representing 60-70% of the length, and distinct from the body by a slight but noticeable constriction in the neck region. The parietal and frontal regions are flattened, the interorbital space is twice or more the greatest diameter of the eye. The snout is broadly rounded.

Scutellation: The rostral is moderate in size and slightly wedging between the internasals in all except No. 11369 in which it is more deeply wedged between the internasals. Rostral as seen from above, one-half its distance from the frontal or less. The dorsal cephalic plates are normal. The nasal is divided with the nostril situated in the anterior half and nearer the internasal than the labial. The loreal is moderate to small, much longer than high and widely separated from the lower preoculars. Two subequal preoculars, the dorsal scale more than twice the larger. The diameter of the eye is 2.8 (1.7) mm. and it is 3.4 (2.0) mm. from the orbit to the nostril, this latter distance being equal to or slightly less than the distance from rostral to the frontal. Postoculars 2-2 (2-2) the upper scale twice the larger or more. Temporals 1-2-3 (1-2-3). The labials are 8-8 (8-8) with one other specimen showing 7-7. The 6th and 7th are the largest and about equal in size, the 4-5th enter the orbit. The lower labials are 9-9 (10-10) with two of the other specimens showing a reduction to 9 scales on one side. The mental is triangle shaped and only partly dividing the first pair of labials. Two pair of genials about equal in size.

Color Pattern for Head and Nape: The cephalic plates are heavily pigmented but mottled with fine light markings. Extending posterior from the eye across the labials is a dark stripe which connects with the large nuchal blotch. The blotch is 9 (7) scales across and dark brown to black, there being but few or no light markings. From the median of the blotch a dark strip extends anteriorly to the

scale immediately back of the parietals. The labials, genials, and gulars are margined and variously flecked with dark markings.

Body and Tail

Size and Proportion: The body is moderately thick and tapers gradually for the last third of the body to the vent. The total length is 581, (204) mm. with a tail length of 78 (32) mm. In only *o. desertícola* have I examined specimens larger than those of this group.

Scutellation: The dorsal scales, except for a few rows above the vent, are smooth, possess but one apical pit and are in 21-21-19-17 longitudinal rows. The reduction to 19 rows occurs at the 116th ventral. (No. 11369 is in poor condition and cannot be used for this character.) The reduction continues to 17 at the 154 ventral, although it occurs before this point in other specimens. In both reductions the 4-5 dorsal rows combine to produce the reduction. The ventrals are 167 (162) with one specimen showing 173 scutes. Caudals 45 (51).

Color Pattern: A median series of large spots extend from the dark nuchal blotch along the back to the tail where they become small and confused. These spots number 47 (44) on the body. Each body spot involves 20 or more scales extending from the 7th or 8th to the 14 or 15th rows and are separated from each adjoining spot by a small light bar about half a scale across. Lateral to the dorsal spots and alternating with them and each other are two rows of lateral spots on the 6-8 and the 3-4 dorsal rows. The scales not in the spots are light brown or brownish gray, but not as light as those dividing the median spots. The under parts are white and immaculate.

Diagnosis: A large sub-species of *ochrorhynchus*, varying from the typical form in having a large dark nuchal blotch which is usually 8 or more scales long at the median and extends laterally to the 3rd row of dorsals; the blotch extending across the labials to the angle of the mouth is not interrupted, but fused with the large blotch. There are 17 dorsal rows at the vent, a lower average in ventrals and caudals (see table II), and the diameter of the eye is less than one-half the interorbital space. Infralabials 10% 8, 40% 9, and 50% 10.

Range: The plateau north of Mexico City, including at least the plateau area of the states of Michocan, San Luis Potosi and Guanajuato, Mexico.

Relationship and Variations: Closely related to *texana* from which it differs in having a large united nuchal blotch. Whether *janii* intergrades with *ochrorhynchus* to the north will not be known until a series of specimens are secured from the area between southeastern

Arizona and northwestern San Luis Potosi.

A study of the scale counts alone parallels those of *torquatus* very closely, however, the loreals of *janii* are not square shaped but much longer than high and there is a greater constriction of the neck region producing a more distinct head than is the case of *torquatus*. Before a true picture of the relationship of any of the Mexican form of Hypsiglena can be seen, a far greater number of specimens will need to be secured from all the Mexican states, on the central plateau as well as the coastal areas on each side.

Remarks: This form has the dorsal spots varying in number from 44-48 with a mean of 46.5 for the group; *o. ochrorhynchus* and *torquatus* both have a few specimens with as few or fewer spots, but the mean for the entire group in each case far exceeds that for *o. janii*. It therefore seems likely that *janii* represnts a form with fewer but larger spots.

HYPSIGLENA O. TEXANA Stejneger

Hypsiglena texana Stejneger; N. Amer. Fauna, no. 7, May 1893, p. 205 (type description; type locality, "between Laredo and Camargo, Texas); Strecker, Baylor Bull., XVII, No. 4, 1915, p. 40.

Hypsiglena ochrorhynchus texana Stejneger and Barbour; Check list N. Amer. Amph. Rept. 1917, p. 93; 2d Ed. 1923, p. 104.

Hypsiglena ochrorhynchus Hibbard; H. ochrorhynchus in Kansas and add. notes on Leptotyphlops dulcis; Copeia No. 1, 1937, p. 74. Gloyd, H. K., and Kuntz, Robert E. H. ochrorhynchus in Okla. Copeia. No. 2, 1940 p. 136; Van Denbourgh, Reptiles of West. N. Amer. Vol. II p 781; Taylor, Mexican Snakes, Bull. Univ. Kan. Vol. 39 no. II 1938 pp. 368-69.

General Description

Head

Size and Proportion: The head is moderate to short, its length only 27-43 per cent longer than its width, the temporal regions are swollen producing a distinct broad head. Cephalic plates usually broadly convex, the parietals and frontal occasionally flat. Head before the eyes round, rapidly tapering to the broadly rounded snout.

Scutellation: Rostral large protruding and wedging between the internasals for a distance equal to 1/3 to 1/2 the distance from the rostral to the frontal; internasals much wider posteriorly; prefrontal, frontal, supraocular and parietal plates normal. Nasal divided, its width greater than half the length, nostril in or anterior to the center; loreal longer than high; two subequal preoculars the upper part at least three times the larger; eye moderate, its diameter slightly less than the distance from frontal to rostral, and equal to 1/2 the interorbital distance; two subequal postoculars, the dorsal scale larger; temporals

normally 1-2-3; upper labials 8-8; lower labials 10-10, mental small, triangle shaped and surrounded by the first pair of labials which meets on the mid-ventral line; two pair of genials, the first equal to or larger than the posterior pair, posterior pair often divided by one or two gulars.

Coloration: Cephalic plates usually a dark grayish brown, mottled with irregular light spots, nape with three distinct elongate dark spots, the median spot extending from the parietals back a distance of from 9-13 scales and is 2-5 scales across; the median spot is divided from the two lateral spots by two distinct light strips about half a scale wide; lateral spots large and conspicuous, extending anteriorly at least to the eye, not divided at the angle of the mouth; a light line borders the lower edge of the lateral spot extending from the nasal posteriorly to beyond the labials, 6th supralabial with the upper half or more in the lateral spot. A dark bar bordering the genials extends across the first 5 infralabials; genials and gulars with varying amounts of pigment.

Body and Tail

Size and Proportion: The body is round stout and with a moderate to short rapidly tapering tail; total length up to 468 mm., average, when compared with other forms.

Scutellation: Dorsal scales in 21-21-19-17 (15) rows, reducing to 19 rows between the 99 and 124 ventral, the reduction to 17 rows occurs between the 124 and 156 ventrals. The uniting of the 4-5 rows produces the reduction in each case. Ventrals from 154-181, subcaudals 38-55.

Coloration: The ground color is dark, due principally to a median series of large dark spots which extend from the nuchal blotch along the back, most spots are complete and extending from the 7th to the 15th row of scales and involving, when complete, 20 or more scales; each spot is divided by an irregular light cross bar about 1/2 to 1 scale across; dorsal spots range from 40-58; lateral to the median spots are two (rarely 3) rows of alternating spots, the first row is large, extending from the 4th to the 7 or 8th row and involving 6 or more scales; the more lateral row of spots is but half the size of the 1st and involving the 2-4 scale rows. Ventrals and caudals rarely with spots or flecks.

Diagnosis: *Texana* is a variation of *ochrorhynchus* from which it differs in having larger spots, and a long median nape spot which extends from the parietals posteriorly for a distance of 9-13 scales and

varies in width only one or two scale rows for the entire distance. Because of the large dark spots the ground color is darker than in typical *ochrorhynchus*; fewer ventrals and a ventral-caudal total which rarely exceeds 224 scutes, upper half of the 6th infralabial in the lateral spot.

RANGE: From northern Nuevo Leon and Coahuila, Mexico, north through Central Texas and Oklahoma to southern Kansas and west into New Mexico. The material examined is as follows:

MEXICO: Nuevo Leon: Huastua Canyon, 11 mi. W. of Montery E.H.T. 5202; Coahuila; 32 mi. W. of San Pedro E.H.T. 4599-4600; and 1½ miles N.W. of Saltillo E.H.T. 4595.

UNITED STATES: Texas: Hidalgo Co., Edinburg, Cornell 1601; Duval Co., San Diego, U.S.N.M. 15672; Webb Co., Loredo (type locality), U.S.N.M. 7124; Reeves Co., Weinath Drow, M.M.Z. 51730; El Paso Co., El Paso, Cornell 667 and Ch.A.S. 5319; Bosque Co., Clifton, Cornell 769; Palo Pinto Co., Palo Pinto, Cornell 2384, Ch.A.S. 10478-9, and L.M.K. 6878; Anderson Co., Montalba, U.S.N.M. 99768; Taylor Co., 20 mi. S.W. of Abilene, Ch.A.S. 11216; Baylor Co., U.C. 12603.

Oklahoma: Comanche Co., 5 miles N.W. of Cache, U.O. 22060-1; 3½ miles N. of Cache near Crater Creek, U.O. 2207 and Ch.A.C. 4674.

Kansas:[8] Barber Co., Sun City, R.U.

New Mexico: Eddy Co., Carlsbad Coverns, M.M.Z. 86163; Bernalillo Co., Carsal Spring, S.U. 5110; Valencia Co., Los Lunas, U.S.N.M. 107347; Catron Co., 1 mile N. of Glenwood, 13 miles S.E. of Glenwood, M.M.Z. 78231-3.

RELATIONSHIPS: Closely related to *o. janii* from which it probably originated, and similar in that the spots are the same size and about the same number, the dorsals reduce only to 17 at the vent and both are dark colored forms. Both *janii* and *texana* have broad heads, and the diameter of the orbit is equal to or less than half the interorbital space. Some specimens from extreme southern Texas, Nuevo Leon, and Coahulia tend toward a uniting of the nape spots into a solid band. This condition is, no doubt, an intergrading character with *janii*. Specimens from the big bend area of the Rio Grande have a much higher ventral-caudal count and a tendency for the dorsals to reduce to 15 rows at the vent. These scutellation differences plus the smaller more numerous spots show an intergradation with *o. ochrorhynchus* to the west. This same set of characters appears in speci-

8. Three specimens reported from Bluff Creek, Clark Co., Kansas, by Hibbard, Copeia No. 1, 1937, p. 74, are well within the scale formulae listed for this species.

mens from Western New Mexico in which intergradation with *o. ochrorhynchus* is evident.

The most typical specimens of *texana* are to be found from Loredo (type locality) east to Edenburg, Texas, north through central and eastern Texas and through Oklahoma to Kansas.

HYPSIGLENA OCHRORHYNCHUS OCHRORHYNCHUS Cope

Hypsiglena ochrorhynchus Cope. Acad. Nat. Sci. Philadelphia, 12, Nov. 15, 1860, p. 246 (type description; type locality, "Cape St. Lucas." Bajo California, John Xantus, collector); and Bull. U. S. Nat. Mus., No. 1, 1875, p. 38; Yarrow, Bull. U. S. Nat. Mus., No. 24, 1883, pp. 15, 97 (Cape San Lucas, La Paz, Baja California; Durango, Mexico; Cope, Proc. Amer. Philos. Soc. Philadelphia, XXXIII, p. 285 (Chihuahua); and Bull U. S. Nat. Mus. No. 32, 1887, p. 78, Proc. U. S. Nat. Mus., XIV, 1891 (1892), p. 617; Stejneger, N. Amer. Fauna, No. 7, May, 1893, pp. 204-205 (Cape St. Lucas); Boulenger, Cat. Snakes British Mus. Vol. II, 1894, p. 209; Van Denburgh, Proc. Cal. Acad. Sci. (2), Vol. 5, 1895, p. 145; Occ. Papers Cal. Acad. Sci., V. 1897, p. 178; Mocquard, Nouv. Arch. Mus. Hist. Nat., Paris, (4), I 1899, p. 325 (Bulege, Bajo California); Cope, Ann. Rept. U. S. Nat. Mus., 1898 (1900), p. 953, fig. 245; Van Denburgh, Proc. Cal. Acad. Sci. (3). Zool., Vol. 4, No. 5, 1906, p. 65; Ditmars' Reptile Book, 1907, p. 329, pl. CI, Fig. 1; Van Denburgh and Slevin, Proc. California Acad. Sci. (4), Vol. 3, 1913, p. 414; Van Denburgh and Slevin, Proc. California Acad. Sci., (4) 5, 1915, p. 106; Stejneger and Barbour, Check list N. Amer. Amph. Rept., 3d Ed., 1933, p. 113; Allen, Occ. Papers Mus. Zool. Univ. Mich., No. 259, p. 12 (Hermosillo, Son.); Taylor, Univ. Kansas Sci. Bull. 24, 1936 (Feb. 15, 1938), pp. 494-495., and Univ. Kansas Sci. Bull., 25, 1939, pp. 357-383, 1 fig. 4 pls.; Little, Copeia No. 4, p. 264.; Perkins, Bull., Zool. Soc., San Diego No. 16, 1940; Smith, Proc. of the U. S. Nat. Mus. Vol. 93, p. 433, 1943; Smith and Taylor, U. S. Nat. Mus. Bul. 189 pp. 72-74, 1945.

Hypsiglena chlorophaea Cope. Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 247(type description; type locality, Fort Buchanan, Arizona, Irwin, collector); Stejneger, N. Amer. Fauna, No. 7, 1893, p. 205; Mocquard, Nouv. Arch. Mus. Hist. Nat., Paris, (4), I 1899, p. 325 and Mission Scientifique au Mexique et dans l'Amerique Centrale, livr. 16, 1908, p. 869, pl. 69, fig. 1. la-d; Garman, Bull. Essex Inst., 16, Jan. 9, 1884, p. 30.

Hypsiglena ochrorhynchus chlorophaea Cope. Proc. Nat. Sci. Philadelphia, 1866, p. 304; and Bull. U. S. Nat. Mus. No. 1, 1875, p. 38 (Arizona); Coues, Wheeler's Rept. Surv. W 100th Merid., V, 1875, p. 622; Yarrow Bull. U. S. Nat. Mus. No. 24, 1883, pp. 15, 97, 190; Garman, Mem. Mus. Comp. Zool., Harvard College, VIII, No. 3, 1883, pp. 80, 161; and Bull. Essex Inst., 16, 1884, p. 30.

Hypsiglena torquata Günther. Biologia Centrali-Americana, Tept. Batr. Oct., 1894, p. 137 (part.); Mocquard, Mission Scientifique au Mexique et dans l'Amerique Centrale, Rept., livr. 16, 1908, pp. 866-868, pl. 69, figs. 3, 3a, 3c, 3d (part). (He states, Bocourt believed H. ochrorhynchus distinct from H. torquata.)

Hypsiglena ochrorhynchus ochrorhynchus Stejneger and Barbour. Check list N. Amer. Amph. Rept., 1917, p. 93; Van Denburgh and Slevin Proc. California Acad. Sci., (4), XI, 1921, pp. 28, 52, 68; Van Denburgh, Occ. Papers California Acad. Sci., X, 2, pp. 780, 783, pl. 85; Stejneger and Barbour, Check list N. Amer. Amph. Rept., 2d Ed., 1923, p. 104.

Leptodeira torquata ochrorhynchus Dunn. Proc. Nat. Acad. Sci. 22, 1936, pp. 691, 695.; Bogert and Oliver, Amer. Mus. Nat. Hist. Vol. 83, art. 6, 1945, pp. 378-81.

General Description

Head

The head is moderate in size, its length 30-43 per cent greater than its width, distinct from body, flat from the eye posteriorly and with a rounded snout.

Scutellation: The rostral is distinct from above, slightly to moderately wedged between the two internasals, its length not exceeding one half the distance from the rostral to the frontal, more commonly 1/3 the distance. Two internasals, prefrontals, supraoculars, parietals and one frontal, all normal; nasal plate divided, the nostril near the center or slightly anterior; loreal moderate to small, longer than high and rarely in contact with the lower preocular; preoculars 2-2 the upper twice that of the lower; eye moderate, its diameter less than the distance from the orbit to nostril and equal to or slightly larger than one half the interorbital space; temporals normally 1-2-3; supralabials 8-8, rarely 7or 9, the 6th largest; infralabials 10-10, the first pair in contact on the mid-ventral line, mental triangle or wedge shape, not ocmpletely dividing the first pair of labials; two pair of genials, the postgenials are larger in 45% of the specimens studied, equal to the anterior genials in 50% of the specimens.

Color Pattern: The head is variable, more commonly it consists of light to medium colored cephalic plates, flecked with small irregular spots and followed posteriorly by three nuchal spots, the median spot is elongate, usually widest from the middle posterior, but often uniform in width, ranging from 7-12 scales long and from 2-5 scales wide; lateral spots large and extending anteriorly to the eye in all but a few specimens. Labials margined and variously flecked, gulars and genials with fine flecking.

Body and Tail

A moderate to slender body with a total length up to 500 mm.; tail moderate to long.

Scutellation: Dorsal scales smooth or with a few keeled or knobed scales above the vent, and in 21-21-19-17-15 longitudinal rows. In a few males and over half of the females there are 17 rows at the vent; the reduction to 19 rows occurs from the 68th-136th ventral, 90% reduce between 105th and 125th ventral; the reduction to 17 rows occurs between the 105-160th ventrals, usually after the 125th; when there is a reduction to 15 rows it occurs between 125th-185th ventral, rarely before the 150th. The first two reductions are accomplished by the uniting of the 4-5 rows on each side while in the last

reduction the 3-4 (2-3 occasionally) unit. Ventrals range from 161-191, caudals from 38-66 scales.

Color Pattern: A series of dark spots extend from the nape posteriorly along the back, over a background of light gray to brown. The spots are medium to small usually extending from the 8th to the 14th rows, involving less than 20 scales and being separated by a light cross bar 1-2 scales across, each spot is about 2 scales long. Lateral to the dorsal spots are 3 rows of smaller spots alternating with the dorsal spots and each other, these spots are usually found on the 1-2, 3-4 and 5-6 rows, usually between the rows, although shifting from one row to another, it is not uncommon and may occur if the spots are small or larger, or if only 2 lateral rows are present; there are from 38 to 71 medium spots on the body, tail spots indistinct for part or all of the distance in most specimens, when distinct, they range from 15 to 36; ventrals and caudals may or may not be flecked, if flecked then near the edges.

Diagnosis: The typical *ochrorhynchus* is distinguished from *texana* by its light pigmentation between and lateral to the dorsal spots, and by the smaller and less extensive dorsal and nuchal blotches. In scalation 70% of the *ochrorhynchus* specimens studied possessed less than 17 rows above the vent. From *janii* it differs in having three nuchal blotch and by smaller dorsal spots. From *venusta* it differs by its larger and fewer dorsal spots which are not divided medially and by fewer ventral and caudal scutes. From *klauberi* by reason of its complete lateral nape spot, and the extension of the medial spot to or within a scale of the parietal. From *deserticola* by it low ventral and caudal counts and also by its elongate medial nape spot. From *unaocularus* and *lorealus* because of its single loreal and from *tortugaensis* because of a much lower caudal count and a complete lateral nape spot.

Range: Arizona, Sonora, Chihuahua, extreme southwestern Texas and the southern portion of Lower California. Specimens from the following localities have been examined:

Mexico: Lower California: Cape San Lucas, L.M.K. 10712-3, 10715-7, 6978, 2729; N.S.N.M. 9216, 37528, and F.M. 25865; La Paz, U.S.N.M. 12648A-B-C; Isla Partida, C.A.S. 51009-10; Sierra Laguna Mts., C.A.S. 45889; San Jose Is., L.M.K. 3815-16, C.A.S. 57398, 57392; El Norvillo, M.C.Z. 36898; Eureka, U.C. 11905-6; Santa Anita, U.S.N.M. 37527.

Sonora: Near Hermosillo, M.M.Z. 72100; Pilores, M.M.Z. 78433; 10 miles N.W. of Guaymas, E.H.T. 4597; 5 miles S.W. of Hermosillo, E.H.T. 4596; 5 miles N.W. of Guaymas, E.H.T. 4598; Guirocoba,

A.M. 63732-7; and Alamos, A.M. 64246.

Chihuahua: Rio Mayo, Guasaremas, M.C.Z. 43273; and U.S.N.M. 14287.

United States: Arizona: Pima Co., Tucson, L.M.K. 32057, 32275, 32292, 32782; A.M. 5099, 62938, 2545, 2542; U.A. 209 (three specimens), C.A.S. 33874, 80731; San Zavier, L.M.K. 32319-20; Saguaro Nat. Mon., S.M. 28; Vail, Cornell 836; Gunsight, C.A.S. 35339; Catalina Mts., C.A.S. 34276; Sabino Canyon, L.M.K. 29507; Santa Cruz Co., Pena Blanca Sp., M.M.Z. 75784; 4 miles S. of Tubac, Ch.A.S. 10347; Nogales, U.S.N.M.17176; Cochise Co., Tomstone, F.M. 543, 903; Bisbee, Ch.A.S. 11287; Pinal Co., in and near Florence, Ch.A.S. 10274-6, 10278-80, M.C.Z. 14453; 6 miles W. of Superior, Ch.A.S. 10277; Superior, M.M.Z. 11977; Casa Grande Nat. Monument, C.A.S. 4491; 5 miles West of Superior, C.M. 19824 Gila Co., Miama, M.M.Z. 84907; Roosevelt Dam, U.S.N.M. 105237; Iron's Ranch between Superior and Miama, Ch.A.S. 10331; Maricopa Co., Arlington, L.M.K. 34347; 7 miles S. of Wickenburgh, Ch.A.S. 3650; Wickenburg, Ch.A.S. 3493; Phoenix, A.M. 9184; U.S.N.M. 56214; Yavapai Co., Ft. Whipple, U.S.N.M. 8032; Yarnell, L.M.K. 8438; Ashbark, 29760; 8 miles N.W. of Wickenburg, Ch.A.S. 3478; Prescott, U.S.N.M. 15701; Coconino Co., 15 miles W. of Winslow L.M.K. 5427; Grand Canyon, C.C.N.P.R. 66, R99; Mohave Co., Kingman, L.M.K. 32320; Navajo Co., 8 miles E. of Winslow, L.M.K. Two specimens A.M. 3709 and C.A.S. 33814 are labeled Arizona. Two specimens U.S.N.M. 8031 and S.U. 4013 are labeled Camp Grant. One specimen C.A.S. 17548 is from Cave Creek and one A.M. 15068 is from Nigger Jim Can. Huachuca Mts.

Texas: Brewster Co., Glenn Spr., M.M.Z. 66020; near Government spr. Chisas Mts., U.S.N.M. 16792.

Relationships: A complete or even a near complete interpretation of this group is quite impossible because of insufficient material ,in many critical areas, and also because the group provides one with such a multitude of problems that considerable time will be needed before many of the complexities can be interpreted. However, certain trends are evident and these shall be dealt with briefly.

Specimens studied from Arizona exhibit a more generalized set of characters than can be found in specimens collected in most other areas; not only do these specimens tend to intergrade with and show striking resemblances to those forms to the south and east but they also tend to intergrade with all other forms north and west of Arizona. In ventral and caudal scalation there is (from the available specimens) a steady increase in numbers from San Luis Potosi, Mexico north

through central Arizona to Utah and the Great Basin area. This same situation exists from east central Texas west through New Mexico and Arizona to the eastern (desert) part of California. In dorsal scalation the trend is reversed, *janii* and *texana* produce 17 dorsal scales at the vent with Great Basin specimens (*deserticola*) to the north and west with but 15 rows in most specimens; Arizona specimens are mixed but with more showing 15 rows. In color pattern a comparable condition exists, *janii* produces a large dark nuchal blotch. Arizona specimens show narrow bands as well as the three spots characteristic of *deserticola*. The size and number of the dorsal spot also vary from south, large and fewer, to north, smaller and more spots.

The specimens from California produce a more confused picture principally because the collecting has been done in widely separated areas such as, near the San Francisco Bay area, Western San Diego County, Cape San Lucus, Santa Rosalia and San Jaquinto. With these groups and the very few specimens collected in between it is impossible to answer why there exists such a considerable variation. It is evident that *venusta* is more closely related to *deserticola* than it is to *ochrorhynchus* at or near the Cape, but I have not seen a specimen which was collected between eastern San Diego County and Santa Rosalia nearly 1000 miles to the south. Specimens collected on the east edge of the peninsula and the islands in the gulf near Santa Rosalia, and south to Loredo and Carmon Island belong to *venusta*, and are distinct in color pattern as well as having more ventral and caudal scutes. The number of ventrals and caudals show an increase from the Cape north (on the east edge only) to Santa Rosalia. Specimens on the Cape and north on the west side are more like those of Western San Diego County (*klauberi*) than they are like *venusta*, but there is a distinctness in the color pattern of western San Diego specimens that is not found in any other form; the nape spots are smaller usually several scales posterior to the parietals, and the lateral spots are divided posterior to the angle of the mouth. Two specimens taken on the Isla Partida are intergrades. The new subspecies *tortugaensis* is closely related to *venusta* but differs in having more caudals, 17 rows at the vent, and longer nuchal spots.

The most perplexing problem is the two separated pockets of *o. ochrorhynchus*, the one at the Cape and the other in Arizona, northwestern Chihuahua and Sonora. *Crotalus v. oraganus* has two distributional areas, the west coast and a smaller pocket in Arizona. In *ochrorhynchus* the two races are much more widely separated and with little chance that they could have been in contact with each other for

a long time. Yet the external morphological characters are similar. Cope's description of specimens from Ft. Buchanan, Arizona as a new species, Chlorophaes, cannot be considered as being a valid form.

HYPSIGLENA O. DESERTICOLA Tanner sub. sp. nov. Pl. I & Pl. III, Fig. 3

Description of the Type

Head

Size and Shape: The head is 38 per cent longer than wide. Flat between the orbits and with a rounded snout; the diameter of the orbit, 2.1, is less than half the interorbital space of 4.7.

Scutellation: Rostral as seen from above 1.1, rostral to frontal, 2.8; dorsal head plates normal; nasal divided, twice as long as high; nostril near the middle of the scale; loreal large, longer than high; preoculars 2-2 the lower scale much the smaller and not in contact with the loreal, postoculars two on the right side, three on the left side, by reason of a division of the lower scute; temporals 1-2-3, the first temporal plate divided; supralabials 8.8; mental moderate; infralabials 10-10; two pair of genials of equal size and separated from the first ventral by 7 gulars.

Coloration: The dorsal plates are uniformly flecked and produce a dark gray color; extending from each eye posteriorly across the lower postocular, the top portion of the labials and the edges of the temporals, is a dark strip which fuses with the lateral spots on each side. Median spot distinct, separated from each lateral spot by a light stripe ½ to one scale wide, and extending from the first scale posterior to the parietals back for a distance of 9 scales. The anterior portion of the spot is 4½ scales long and 2½ rows wide, while the posterior portion is 4½ scales long and 7 rows wide; lateral and medial spots dark brown.

Dentation: There are 8 small anterior superior maxillary teeth followed after a short space by two large ungrooved fanglike teeth.

Body and Tail

The body is cylindrical and with a total length of 392 mm. of which the tail comprises 66 mm.

Scutellation: Dorsal scales in 21-21-19-17-15 rows; all smooth except a few above the vent which bear small knobs near their base; the first reduction occurs at the 118th ventral by a fusion of scale rows 4-5, the second reduction occurs at the 131st ventral by a fusion of the same scale rows, the third reduction occurs at the 167th ventral with rows 3-4 uniting on one side and 2-3 on the other; ventrals 189; anal

plate divided, and with 56 pairs of subcaudal scutes.

Coloration: The dorsal color pattern is one of a gray background with a series of 52 medium sized brown spots, extending from the head along the back to the tail where spotting becomes indistinct and confused; each dorsal spot extends from the 8th to the 14th scale row and is from 1-2 scales long and involves 12-15 scales; spaces in between the spots lighter in color than those scales lateral to the spots and from 1½ to 2½ scales long; lateral to the dorsal spots are three rows of smaller spots which alternate with the dorsal spots and each other, these spots are on the following scale rows, 5-7, 3-4 and the 1-2, lateral spots small but distinct; ventrals and caudals immaculate except for fine flecking near the dorsals.

Diagnosis: Related to *H. o. ochrorhynchus*, but differing from it in the following color and scale characteristics: medial nape spot greatly enlarged posteriorly, as wide as half its total length or more, lateral nape spots complete, the number of dorsal spots high 49-75. Dorsal scales mostly in 15 rows at the vent. Ventrals high, male 177-195, female 186-204, caudals male 49-66, female 44-57; spots medium to small.

Type: B.Y.U. No. 2836, a male collected from under a rock on a small isolated ridge which juts out into the valley and is near the road which leads from chimney rock pass to Fairfield, on the west side of Cedar Valley, between 3 and 4 miles northwest of Chimney Rock Pass, Utah Co., Utah. This specimen was collected by the author, August 11, 1939, and is deposited in the Brigham Young University herpetological collection.

The following paratypes all collected in Utah County are listed as follows: B.Y.U. Nos. 2196-98 are topotypes; No. 2198 is being sent to the U.S. National Museum, and No. 2197 to Stanley Mulaik at the University of Utah. B.Y.U. Nos. 2709, 2026-28, 7937, 8014 and M.M.Z. 92327 from Meseda Bench foot hills, near Chimney Rock Pass northwest end of Utah Lake; B.Y.U. No. 640 from the foot hills west of the northwest end of Utah Lake; and B.Y.U. Nos. 3014, 3938 and 8011 Bonneville Terrace at the base of "Y" Mountain east of Provo. Other material examined is as follows:

Utah: Utah County; Meseda Bench, B.Y.U., Nos. 3960, 2045 and 7020; Alpine, No. 6924; Salt Lake Co., N.E. edge of Salt Lake, Ft. Douglas, U.U. 1402-7, 1416, C.A.S. 30925-6; Box Elder Co., Brigham City, Ch.A.S. 5318; Washington Co., Zion Canyon Nat. Park, B.Y.U. 2039, 2336, 90, 3958-9 and Z.N.P. 22, 55A-B, 70; St. George, B.Y.U. 376, 1318, 1512, and R.H. 1495A, D.C. 72, 61-2 and one specimen

without a number; Watercress Spr., R. H. 21 and 77A; Beaver Dam Mts., R.H. 1828A and B.Y.U. 2968.

Washington: Grant Co., Vantage Ferry, U.W. (three numbered specimens).

Oregon: Umatilla Co., Hermiston, C.P.S. 3709, 3714.

Idaho: Ada Co., Swan Falls, I.S.M. 8, 7 miles E. of Boise, I.S.M. 9, 15 miles S. of Boise, C.A.S. 64998 and M.M.Z. 68297; Canyon Co., 2 miles S. of Melba, U.C. 18304.

Nevada: Humboldt Co., Winnemucca, B.Y.U. 2912; Nye Co., Current, S.W. 7508; White Pine Co., U. C. 24584; Clark Co., Virgin Valley, U.C. 1277.

Arizona: Cocouino Co., Bright Angel Creek, Grand Canyon Nat. Park, U.S.N. M. 44266.

California: Mona Co., 2 miles W. of Shealy, U.C. 12765; Inyo Co., Argus Mts. C.A.S. 65502, U.S.N.M. 18071; Wild Rose Canyon, Panament Mts. U.C. 18049-50; Alabama Hills 3 miles W. of Lone Pine, U.C. 6688; 5 miles N. of Tourne's Pass, L.M.K. 25360; San Bernadino Co., Cedar Canyon, Providence Mts. U.C. 26659 (intergrade); Riverside Co., Bird Canyon, Little San Bernadino Mts. L.M.K. 31540; Fan Hill, Little San Bernadino Mts., L.M.K. 31549; Cottonwood, C.A.S. 64675; San Diego Co., Sentenas Canyon, L.M.K. 26818. 28873, 29272, 33899, 32044, 34016, 34289, 34380, 4725; the Narrows, 28807, 31332, 31974, 33325, 33425; 1½ miles E. of the Narrows, 32946; Yaqui Well, 526, 2644-6, 31449, 32985; San Felipe Valley, 4075-6, 4374, 33722; 2½ miles E. of the Scissors, 33219; one specimen 28834 labeled San Diego; Borego Rd. at Borego Palms Rd., A.M. 64382; Emperial Co., a specimen collected at Frink Springs and reported by L. M. Klauber (1938) is considered as belonging to this subspecies.

Relationship and Variation: The subspecies *deserticola* is a desert form, which has apparently developed from those *ochrorhynchus* to the south and southwest of its range. Certain degrees of intergradation are noticeable in specimens on both sides of the Pacific Coast and Great Basin divide, this is also true east of the Colorado River in Arizona, where specimens exhibit relatively high ventral and caudal counts, a few also exhibit similar color patterns. Of the typical specimens, the lowest ventral-caudal total found in *o. deserticola* equal 229 scutes, yet a specimen No. U.C. 26659 from Cedar Canyon, Providence Mts. San Bernidino Co., has but 225 scutes, a condition typical in *o. ochrorhynchus*. The color pattern is typical to *deserticola*. The intergrades along and west of the Colorado River tend to show a re-

duced ventral-caudal count while those in Arizona produce a slight increase. The Arizona forms do not produce the same color pattern. Of special interest are three specimens from Grand Canyon National Park, one male specimen is very typical of *deserticola* with 194 ventrals and 61 caudals and with a large medial nape spot while two others, both females, have 181, 178 ventrals and 42, 42 caudals respectively. In both specimens the medial nape spot is as long but much narrower. Whether intergradation occurs between *deserticola* and *venusta* will have to await further collecting on the northeast coast of lower California.

It is interesting to note that the three northern forms of the genus, *o. nuchalatus, o. deserticola*, and *o. lorealus*, produce the highest ventral and ventral-caudal counts in the genus. This cannot be explained by referring to them as desert forms because *nuchalatus* inhabits a relatively moist area. As it now stands the ventral counts increase on a south to north axis, but with a slightly greater increase in desert areas.

Remarks: The average lengths of specimens within the various groups have proved of great interest, especially since certain groups are represented by enough specimens to provide a fair basis for comparison.

	Largest Specimen	Average	Smallest	No. of Specimens
o. deserticola	642	329.41	166	104
o. klauberi	395	274.58	154	114
o. ochrorhynchus from Arizona and Sonora	503	336.9	173	68
o. texana	486	289.5	154	29
o. lorealus	502	364	212	9
o. venusta	363-95	311-76	220-62	9

For further comparisons of variations see table 2.

The food habits of this subspecies are known to consist of *Uta, Amphibia*, and since other related groups have eaten other small lizards it is surmised the small lizards in any area provide a share of the food. A large specimen collected in the foot hills west of the old Meseda bench, Ut. County, was placed in the same collecting bag with a *Uta. S. stansburiana.* A short time later the lizard was in the process of being eaten; ten minutes later the lizard had been eaten. A few hours later it was regurgitated undigested. Hardy, 1939, had similar experiences with *lorealus*, but was also able to stimulate feeding on small lizards, *Uta* and *Sceloperus*. A large specimen collected by Dr. V. M. Tanner

in Zion Canyon National Park had just eaten a medium-sized *Hyla arenicolor* Cope. The specimen was found under a log about five o'clock P. M. A specimen collected in the same park at a later date had eaten a toad. Observation of this sub-species in captivity show it to be a very nervous, restless snake, not easily adaptable to the average conditions imposed upon it in captivity.

HYPSIGLENA OCHRORHYNCHUS LOREALUS W. Tanner, subsp. nov.

Pl. II, Figs. 1 and 8

Description of the Type

Head

The head is typical to *ochrorhynchus*, moderate in size, distinct from the body, and minutely convex between the orbits and across the parietals. The diameter of the orbit (1.9) is equal to one half the interorbital space (3.8).

Scutellation: Rostral as seen from above 0.9 mm., which is less than one-half of the distance (2.4) from the rostral to the frontal. Other dorsal head plates are normal for the species. Nasals normal; two loreals on the right side, the extra scute is developed from the upper edges of the 3rd and 4th labials, and is only slightly smaller than the normal scale; four loreals on the left side, the two lower anterior scales are derived from the labials while the posterior one appears to have been a result of a division of the lower preocular; preoculars 2-2; labials eight on the left side with nine on the right, the third labial is divided to produce the extra labial; postoculars 2-2; temporals 1-3-3 left side, 2-3-3 right side. Infralabials 10-10; posterior genials larger and with 7 gulars between the posterior genial and the first ventral.

Coloration: The dorsal plates spotted and, or mottled; producing a brownish gray color; a dark brown strip extends from the orbit back beyond the angle of the mouth where it contacts the lateral nuchal spot; medial nape spot 9 scales long and 8 scale rows wide at its greatest width, anterior portion narrow, 2-3 rows wide, medial spot separated from the laterals by a very distinct narrow light strip.

Body and Tail

Scutellation: Dorsal scales in 21-21-19-17-15 rows; the first reduction occurs at the 112th ventral by a fusion of the 4th and 5th rows, the second occurs at the 133rd ventral with the 3rd and 4th rows uniting; the third reduction occurs when the same rows again fuse at the

168th ventral. Ventrals 187; caudals 52, three scales beyond the vent, 6 scutes are united.

Coloration: The dorsal color is light gray with a series of 71 medium to small dorsal spots extending from the nape to above the vent. Each spot extends from the 8th, across the dorsum to the 14th row, and involves 7-14 scales, 7 if the spot is divided, near 14 if complete; each spot is one to as much as one and a half scales long. The intervening spaces between the spots, lighter than any other dorsal areas and 1½-2½ scales long; lateral spots in three alternating rows, small, distinct but with reduced pigmentation; between the large dorsal spots and the first lateral row there is at least one row of scales separating the two rows of spots; tail without distinct spotting; ventrals and caudals immaculate.

Dentition: Eight subequal anterior superior maxillary teeth, followed by one large ungrooved fang-like tooth.

Diagnosis: A subspecies of *ochrorhynchus* closely related to *deserticola* in that it has a similar color pattern and a high ventral and caudal scale count. Distinct from all *ochrorhynchus* in having two large loreals on each side.

Type: An adult female B.Y.U. No. 2829 collected at the west edge of Castle Dale, Emery County, Utah, June 17, 1939 by Dr. Vasco M. Tanner.

There are six paratype specimens with the following data: Emery Co., 5 miles south of Castle Dale near the main road, B.Y.U. 2192. Carbon Co., collected in and near Price, A.H. 1075-6 and 1143, Columbia 946; Grand Co., La Sal, M.M.Z. 68595.

Other Material: Two specimens collected at Mesa Verda National Park, Colorado.

Variations and Relationships: *lorealus* represents an offshoot of the more abundant and widespread Great Basin form, *deserticola*. Except for the increase in loreals the scale counts are similar. In color pattern the median nape spot is slightly wider and is united on one or both sides in a few specimens; the spots are smaller and the spaces between the spots are equal to or greater than the length of the preceding spot. The other subspecies vary widely, not only in color pattern but also in ventral and caudal counts.

Remarks: The type specimen was gravid at the time of collecting. Three eggs were felt soon after she was collected. The specimen was placed in a separate bag and placed in the car, in spite of careful handling, three eggs and nine shells were produced before we returned to camp. Two eggs were fully distended while the third was soft and

not entirely filled; the 9 shells appeared normal and were folded together in a cluster. It seems quite unlikely that the specimen was injured either in collecting or during our travels. The three complete eggs were placed on moist warm sand for over a month; the eggs were then opened, none showed any sign of development.

The double loreal in *lorealus* is a result of the labials cutting off a scale nearly as large as the normal scute, this is not true in other specimens of the genus where two scutes are produced, in these few specimens the extra loreal usually appears wedged between the larger loreal, preoculars and one or two labials. In such cases it is difficult to tell the origin of the extra scute, as it might have come from a corner of either of the adjoining scales.

HYPSIGLENA O. NUCHALATUS W. Tanner, Pl. III, Fig. 2

Hypsiglena ochrorhynchus ochrorhynchus Van Denburgh, The Reptiles of West N. America, Vol. II. Snakes and Turtles, p. 783, Nov. 23, 1922.

Leptodeira torquata ochrorhynchus Klauber, The Subspecies of the spotted Night Snake. Copeia, No. 4, p. 192, 1938; Fitch, Leptodeira in Northern California, Herpetologica Vol. I No. 6, pp. 152-53, 1939.

Hypsiglena nuchalatus Tanner, Two New species of Hypsiglena from Western North America, Great Basin Naturalist, Vol. IV. Nos. 1 & 2, pp. 53-54, June 30, 1943.

Hypsiglena t. nuchalatus Bogert and Oliver, Amer. Mus. Nat. Hist. Vol. 83, art 6, 1945, pp. 378-81.

General Description

Head

Size and Proportions: The head is elongated, the width representing 49-61% of the length. Type, head length 9.6 width 5.5, per cent of width to length 57.3, rostral .9, rostral to frontal 1.8, diameter of orbit 1.6, interorbital space 3.2 mm. The top of the head is flattened, the snout is rounded, and the temporal regions are enlarged enough to make the head distinct from the body. Rostral as seen from above less than 60 per cent of the distance from the rostral to the frontal; length of eye equal to or greater than half the interorbital space in 81% of the specimens studied.

Scutellation: The rostral scale is moderate to large and protruding well beyond the mental scute, giving an appearance of elongation. The dorsal cephalic plates are normal. Nasal divided (rarely single), twice as long as wide and with the nostril located very near the center but slightly nearer the internasal than the labial. The loreal is moderate much longer than high, and not in contact with the lower preocular. Two preoculars the upper one much the larger; eye mod-

erate, its diameter equal to the length of the nasal scale or slightly larger. Two subequal postoculars the upper scale at least twice the larger. Temporals 1-2-3. The upper labials are normally 7-7, but occasionally 8-8, the 3-4 enter the orbit and the first tends to wedge between the nasal and the second labial, to contact the loreal in many specimens. The mental is elongate often dividing the first pair of lower labials, which otherwise make contact on the mid-ventral line. The lower labials are 10-10. There are two pair of equal or subequal genials.

Coloration: The cephalic plates are brown, with a few dark spots on the frontal and the parietals. Posterior to the parietals is a large irregular blotch which extends entirely across the nape to the 2nd or 3rd lateral scale row, and is 4-6 scales across at the median. The lateral edges of the blotch extend anteriorly to form a narrow stripe to the orbit. The labials are margined with dark spots, and the genials and gulars are finely flecked.

Body and Tail

Size and Proportion: The body is slender and elongate, with but little tapering before the vent. The tail is short to medium in length and rapidly tapered to the end.

Scutellation: The dorsal scales are smooth, except for a few rows about the vent, and in 19-19-17-15, longitudinal rows, a few with 21 rows on the anterior of the body, (see key). The reduction to 17 scales occurs between the 104th and 145th ventral with the uniting of the 4-5th rows, the reduction continuing to 15 rows between the 147th and the 190th ventral by combining the 3-4 or, more rarely, the 2-3 dorsal rows. The ventrals range from 179-201 and the caudals vary from 40-53.

Coloration: The upper surface is brownish-gray and with a series of large spots extending from the nape to the tip of the tail, each spot extends across the body from the 7th to the 13th scale row and is 2-3 scales long, separated by a light bar 1-2 scales across. Lateral to the median spots and alternating with them and each other, are two rarely three rows of smaller spots, located along the 2-3 and the 4-6 scale rows. Under parts white.

Diagnosis: A sub-species characterized by having a dark nuchal band, and a narrow head. The orbit is equal to or greater than half the interorbital space, rarely less; dorsal scale formula normally 19-19-17-15; supralabials 7-7; body and tail spots distinct. Ventral count high, 179-201.

Range: The western slopes of the Sierra Nevada Mountains from Tulare County in the south to Tehama County in the north. The following material was used in this study:

California: Tulare Co., Lemon Cove, B.Y.U. 3008; Sequoia Nat. Park, U.C. 19328-30 and 19207; Visalia, L.M.K. 20233, 20293 and 22501; Madera Co., near Oneals, U.C. 27487; Contra Coasta Co., hill near Christy, U. C. 2476; 4 miles S.E. of Mt. Diablo, U.C. 28202 and C.A.S. 30876, no data; Alameda Co., Mission Park, U.C. 20505; Mt. Diablo, S.U. 8070; Butte Co., Oroville, U. C. 24118; Tahama Co., Paynes Creek, U.C. 20486.

Relationship and Variations: This group represents an offshoot from those forms to the south and east of it. It undoubtedly intergrades with *klauberi* in Kern Co., and is undoubtedly a subspecies of the ochrorhynchus groups. Two specimens from Kern Co., reported to me by Mr. George H. Halney tend to confirm this belief.

HYPSIGLENA O. VENUSTA Mocquard, Pl. III, Fig. 7

Hypsiglena venusta Mocquard, Arch. Mus. Paris, ser. 4, Vol. 1, 1899, p. 327 (type locality, Santa Rosalia and San Iqnacio, Lower California, Mexico.)

Leptodeira torquata venusta Dunn, Proc. Nat. Acad. Sci., Vol. 22, 1936, pp. 694-695.

Leptodeira torquata ochrorhynchus Klauber, Copeia, No. 4, 1938, pp. 192-193; Bogert and Oliver, Amer. Mus. Nat. Hist. Vol. 83, art 6, 1945, pp. 378-81.

Hypsiglena ochrorhynchus Taylor, Univ. Kansas, Sci. Bull., Vol 25, 1938 (1939), pp. 357-83, 1 fig. 4 pls.

Hypsiglena ochrorhynchus ochrorhynchus Smith and Taylor, U. S. Nat. Mus. Bull. 187, 1945, pp. 72-74.

General Description

Instead of a redescription of this subspecies it has been deemed desirable to restate Mocquard's description in an English translation.

"Six specimens of Hypsiglena, five of which were captured at Santa Rosalia and a sixth at San Ignacio, have an appearance very different to the preceding (ochrorhynchus).

"The dorsal spots are much more numerous and smaller, they are of a rather pale brown on an ash background, and are sometimes bathed in rose; opposite or alternating and as long as the length and one half of a scale, they occupy at the most the width of 2-3 scales and are in two longitudinal series, rather regularly spaced. Besides these dorsal spots there are three other longitudinal rows of lateral spots smaller, stippled, and of the same shade and alternating generally with the preceding row. These lateral spots are ordinarily situated between the 6-7, 3-4 and the 1-2 rows of dorsal scales. Each series contains about 80 spots and they extend from the nape to the beginning of the tail. In one of the specimens, and only for a distance of 5-6 cm., the spots (dorsal) of each side join those of the other to form transversal (cross) bands.

"The dorsal part of the head is finely stippled with dark brown. On the nape

may be observed the same three large spots that are found in *H. ochrorhynchus,* but they are black, and the lateral ones extend forward to the nasal, being interrupted at the level of the eye. These lateral spots join with the median spot in one specimen. The ventral side is grayish white, it is the same for the lips and throat which are stippled with brown, with a little brown spot more or less distinct on the sutures which separate the first 5-6 supralabials.

"Our six specimens are all provided with a small pseudo-preocular. There are eight supra-labials (9 by exception); a series of 21 scale rows, very finely striated (1) and provided with one apical pit. The number of gastrosteges varies from 178 to 186; that of the urosteges from 47 to 58, two of these last plates are single in one specimen; there are six of them in another. The rest of the specimens are the same as in *H. ochrorhynchus.*

"The longest has a total length of 340 mm. of which the tail is 55 mm., almost a sixth of the total length.

"These specimens can't be related to *H. ochrorhynchus,* from which they differ by having a greater number of gastrosteges (178-186 instead of 157-178), by a shorter superior ocular, by the coloration and a more slender form.

"We would not hesitate to identify them with *H. chlorophaea* if Stejneger did not inform us that the individual type of this species lacks the psudo-preoculars, the type that we have just described could not be compared to it and we would propose to give it the name of *H. venusta.*

"(1) These strieas which have not yet been pointed out in *H. ochrorhynchus,* are observed as well in *H. affinis.* We conclude from it that striation of these dorsal scales is found also in other species of this genus and that it constitutes a generic characteristic."

Diagnosis: A form closely related to *deserticola,* but differing in that there are fewer ventrals, 174-190, at least a lower average, more than in *klauberi* or *ochrorhynchus,* more dorsal spots (up to 95) than in any other form, and with the dorsal spots dividing to produce two rows instead of one. Thus the spots are said to be "opposite or alternating."

Range: From Santa Rosalie south to Loredo including the adjoining coastal island, and extending inland to the mountains, but apparently not extending to the west side of the central range. The following material was used in this study: San Ignacio, L.M.K. 3817 and U.C. 13775; Camondu, U.C. 13774, and F.M. 25866; trail between Loredo and Comando, U.S.N.M. 67378-9; Carman Island, C.A.S. 51814 and M.C.Z. 31583; San Marcas Island, C.A.S. 51462.

Remarks: This subspecies is related to *o. ochrorhynchus* and *o. deserticola.* The extent of its variation is mainly in its unique color pattern. Small dorsal spots, which are greatly increased in number (62-95, average 76) and also in the division of the medial row of spots into two rows. Mocquard refers to this condition when he states that they are "opposite or alternating." The specimens examined for this report show this condition to a varying degree, some for the entire length of the body, with others only half or two thirds of the body, but all were characterized by it. A large specimen from Carmen Island has

extended the separation to the medial nape spot. The lateral nuchal spots, as suggested by Mocquard, do extend through the eye to the nostril. In scutellation *venusta* produces high ventral and caudal counts when compared with *o. ochrorhynchus*. This is more apparent when the ventral-caudal totals are compared.

HYPSIGLENA O. TORTUGAENSIS W. Tanner, subsp. nov.

Pl. II, Figs. 3 and 4

Description of the Type

Head

Size and Proportions: The head is forty-one per cent longer than wide, slightly convex between the orbits and not greatly swollen at the temporal regions; eye large, its diameter equal to or greater than the interorbital space.

Scutellation: Rostral normal, its length, as seen from above 1.2, less than one half the distance (3.2 mm.) from the rostral to the frontal; other dorsal plates normal; nasal plate divided and more than twice as long as high, the posterior end is elongated and wedges part way between the second labial and the loreal; loreal moderate, triangle shape and not in contact with the small lower preocular; preoculars 2-2; eye normal, its diameter 2.4 mm.; postoculars 2-2, subequal; temporals 1-2-3; supralabials 8-8; infralabials 10-10, the first pair separated part way by a normal scute; two pair of genials, the anterior pair larger, and with seven gulars between the genials and the first ventral.

Coloration: The head plates are brownish gray with a few small spots which are principally on the prefrontals; the parietals are not distinctly spotted; extending from the scale immediately posterior to the parietals is an elongate dorsal blotch 13 scales long and increasing in width from the anterior to near the middle, from 1-4 scales. The dorsal blotch is separated from two lateral blotches by 1-1½ rows of light colored scales; the lateral blotches are separated from the parietals by four rows of light colored scales, which in turn are in contact with the light line separating the nuchal blotches. The lateral blotches are separated by a light scale just posterior to the supralabials, the anterior portion extends across the labials to the eye; the labials and chin scales are mottled and flecked with brown.

Dentation: There are six small teeth, two broken off, for a total of eight anterior superior maxillary teeth followed by two large fanglike teeth.

Body and Tail

The body is cylindrical and with a total length of 452 mm. of which the tail makes up 73 mm.

Scutellation: The dorsal scales are all smooth and in 21-21-19-17 rows; the first reduction occurs by the fusion of the 4th and 5th rows at the 129th ventral, the second reduction occurs by a fusion of the same rows at the 149th ventral; there are 190 ventrals and 57 subcaudals, the anal plate is divided.

Coloration: The upper surface has the appearance of dark brown with a series of dark dorsal spots extending from the nape region posteriorly. The spots extend from the 8th to the 14th scale rows and are 2-3 scales in length; the scales in the spots are flecked and streaked with dark markings, but usually with a lighter area in the center. Dorsal spots on body 63, on tail 15, the posterior half of tail mottled, not distinctly spotted. Lateral to and alternating with the dorsal spots is a row of smaller spots on the 5-7 rows; a second lateral row of spots opposite to the dorsal spots is found on the 3-4 rows, and a third lateral row alternating with the dorsal spots is found on the 1-2 rows. The ventrals and caudals are flecked with a large number of very small brown spots, which are more numerous near the dorsals.

Type: California Academy of Sciences, No. 51460, collected at Tortuga Island June 22, 1921, by Joseph R. Slevin.

Paratype: L.M.K. No. 4074, Tortuga Island.

Diagnosis: A subspecies of *ochrorhynchus,* with an elongate narrow medial nape spot and with the lateral spots divided just posterior to the angle of the mouth. The ventrals are higher than in typical *ochrorhynchus*; in this respect *tortugaensis* is more nearly like *venusta* and *deserticola.* The high number of caudals distinguish it from all other forms and the much higher ventral-caudal totals separate it from any *venusta* or *ochrorhynchus* in lower California.

Distribution: Known only from Tortuga Island, Baja California.

Remarks: The island Tortuga is located some twenty miles northeast of Santa Rosalia, and is therefore directly opposite the area occupied by *venusta.* A comparison of these two forms provides evidence to support the belief that *tortugaensis* has been modified into its present form from *venusta* stock. It seems unlikely that it could have originated directly from typical *ochrorhynchus.*

The caudal counts on the two female types (57 and 59) are much higher than is found in any other form, except *deserticola* where one female specimen out of a series of 42 shows 57 scutes, the next highest is 54 and the average is 52 scutes. In view of the fact that caudal

counts in male specimens is higher than those of females it would not be surprising to find *tortugaensis* with the highest caudal counts for the genus.

HYPSIGLENA O. KLAUBERI W. Tanner, sub. sp. nov.

General Description

Head

Top of head slightly convex from eye to rostral; the space between the nostrils only slightly less than one half the interorbital space.

Scutellation: Rostral broad and rounded, its length less than one half the distance from the rostral to the frontal; other dorsal head plates normal; nasal divided, loreal single not touching the subocular, two preoculars; two postoculars; temporals 1-2-3. Eight supralabials; ten infralibials, the first pair joined on the mid line behind the mental scute; posterior genials equal to the anterior pair.

Coloration: The top of the head is uniformly flecked with dark pigment, there may be aggregates of chromatophores, but there is no definite pattern. A dark band passes posterior from the eye to and slightly beyond the angle of the mouth where it terminates. A light space 1-3 scales wide separates this band from the large lateral nape spots. Three nuchal spots. The medial spot elongate, 5-11 scales long and 2-7 scale rows wide; the anterior point usually 2-6 scales posterior to the parietals. In some specimens this point reaches the parietals, in others the point is represented by a dot immediately posterior to the parietals, and in a very few the medial spot is entirely absent. Lateral blotches large, dark and at times fused with the medial spot by a few scales, rarely both sides fuse in the same specimen; divided at or just posterior to the angle of the mouth. Underside variously flecked and with a dark bar extending across the anterior infralabials.

Body and Tail

Scutellation: Dorsal scales smooth and in 21-21-19-17 (15) rows. The reduction to 19 rows usually ocurs from the 100th ventral to the 128th. The second reduction is extremely variable and ranges from the 118th to 160th ventral, when present the reduction to 15 rows takes place beyond the 150th ventral. Ventrals, males 161-180; females 173-189; caudals, males 46-56; females 39-49.

Coloration: A series of 40-61, medium to large dark brown spots extends from the median nape spot posterior to the end of the tail; each complete spot involves from 12 to 18 scales and usually occupies

the 8th to the 14th dorsal rows. Each spot is 1½ to 2½ scales long and are separated from each other by a light band at least one scale in length. Two or three lateral rows of spots alternating with the dorsal row and with each other. First lateral row largest, third when present smallest. Tail spots faint but usually distinct. Ventrals and caudals cream color, rarely flecked.

Description of the Type: Head broad, the orbit less than one half the interorbital space, snout blunt; neck heavy, not noticeably constricted. Head plates normal for the species. Dorsal scales in 21-21-19-17 longitudinal rows; the first reduction occurs at the112 ventral by combining the fifth and sixth rows, right side and 114th ventral by combining the fourth and fifth rows left side. The second reduction to 17 begins at the 140 ventral by combining the fourth and fifth rows right side, and at the 142 ventral left side. There are 178 ventrals and 56 caudals. Total length 327 mm., tail length 60 mm., ratio of tail to total length 18.35.

The color pattern is generally darker than for specimens found on the main land. Head mottled above and with considerable pigment in all of the dorsal plates; labials with a dark stripe extending from the eye back to the eighth labial, it does not fuse with the lateral nape spot as is customary in other forms of *ochrorhynchus*; other labials margined or spotted; genials and gulars finely flecked and spotted. Nape with three spots, the median spot five scales long and seven rows wide, this produces a nearly square spot, 3½ scales posterior to the parietals; laterals slightly fused to the median spot. Dorsal spots medium to large, heavily pigmented and in a series of 47 spots to the vent, tail with 25 spots; lateral to the dorsal spots are two distinct rows of small dark spots, scales not involved in the spots heavily pigmented.

Type: L.M.K. 20228 collected in South Cornoado Island, lower California on June 11, 1933 by Philip M. Klauber, son of Mr. L. M. Klauber.

There are two paratype specimens, both are females. One specimen S.U. 6678 has 180 ventrals, 44 caudals, 49 spots and has the nape spot 4½ scales posterior to the parietals. The others pecimen, C.A.S. 13602, has 177 ventrals, 45 caudals, 48 dorsal spots and with the median nape spot 4 scales posterior to the parietals. Both specimens have interorbital spaces greater than twice the diameter of the orbit.

Diagnosis: A sub-species of the *ochrorhynchus* group which varies from other forms in having a median spot which is 3-5 scales posterior to the parietals; the dark line extending posterior from the eye rarely contacts the lateral nuchal blotch, nor does it extend anteriorly

beyond the eye; the eye is moderate, its diameter less than ½ the interorbital space.

Other material examined is as follows: California: Los Angeles Co., Los Angeles, C.M. 16793-4. Palos Verde Estates, L.M.K. 28559. Palmdale, L.M.K. 20458. Mt. Wilson, U.C. 4864. West Los Angeles, A.M. 64383; San Bernardino Co., about 80 miles E. of Los Angeles, C.M. 16796. Morongo Valley, L.M.K. 28739. San Bernardino Mts. near Santa Anna River, U.C. 639. Two miles east of Strawberry Peak, U.C. 13107. Hesperia, C.A.S. 36284 and Strawberry Valley, S.U. 4015; Kern Co., Lemon, L.M.K. 8792; Orange Co., San Clemente, L.M.K. 1038; Riverside Co., Banning, U.S.N.M. 75176; San Diego Co., San Diego, L.M.K. 1263, 30480, 24274, 28310, 4605, 30450, 6630, 33324, 32457, 32836, 233, 24213, 3210, 28331, 3150, 1498, 22714, 28337, 28309, 1202, 2922, 33758-9; C.M. 16795; C.A.S. 64482-3; M.C.Z. 20475; Santa Ysabel, L.M.K. 4883, La Jolla, L.M.K. 5286 and 34193, Solana Beach, L.M.K. 1040, Box Canyon, L.M.K. 25697, Carlsbad, L.M.K. 26737, Alpine, L.M.K. 23162, 33426 and U.C. 27024, Lemon Grove, L.M.K. 23185, 20007, Rose Canyon, L.M.K. 3138, Encanto, L.M.K. 1172, Morena Dam, L.M.K. 20295, Descanso, L.M.K. 3385, Mussey, L.M.K. 235, Palomar, L.M.K. 22406, Santa Fe Ranch, L.M.K. 905, 1659, Jamul, L.M.K. 4337, Otay Dam, L.M.K. 27116-8, Rainbow, L.M.K. 28681, Dear Horn Flats, L.M.K. 31333, 571, Viejas, F.M.8439, Witch Creek, U.S.N.M. 2482, San Jacinto, S.U. 4016, 4014, Eagle Peak Grade, L.M.K. 21273, Mission Valley, L.M.K. 9910, San Pasqual, L.M.K. 101, Challas Heights Radio, L.M.K. 238, Boulder Park, L.M.K. 2300, Romona, L.M.K. 31215, 8505, half way between Romona and Ballena, L.M.K. 9956, Esconidido, L.M.K. 5031, M.M.Z. 70377, Sun Crest, L.M.K. 22141, El Capitan, L.M.K. 21271-2, Radio road E. San Diego, L.M.K. 1170, Jacumba, L.M.K. 171, La Mesa, L.M.K. 3450, Spring Valley, L.M.K. 4975, Bird Rock, L.M.K. 527, Wynola, L.M.K. 9955; three specimens, U.S.N.M. 22579, C.A.S. 64441 and 64434 are listed for the county with no locality data.

Bajo California: Descanso Point, L.M.K. 2582, San Pedro Martir Mts., L.M.K. 9933, San Pedro near Laguna Hanse, L.M.K. 10415-6, Cerros Islands, U.S.N.M. 59371.

Variations and Relationships: A single male specimen S.U. 8071 listed from the San Diego City Dump has 185 ventrals and 60 caudals, 9 more scales than is found in any other specimen studied from the Pacific side; the supralabials are 9-9, infralabials 10-11. Other characters are normal. A male specimen M.M.Z. 70377 collected at Escondido has only 161 ventrals and 46 caudals, both counts

are the lowest for the new subspecies. A female specimen L.M.K. 9933 collected in the San Pedro Martir. Mts. Bajo, California, is variable to other *klauberi* in the following characters, 23 dorsal rows from the 47th to the 80th ventral, but with 15 rows at the vent; 7-7 supralabials; and with a distinct light cream band 4 scales across at the dorsum, followed by a dark band which extends down to the 3rd scale row and 3 scales across. The dark stripe from the eye is divided, from the anterior portion of the dark band, at the angle of the mouth. One male specimen L.M.K. 34193 also has 7-7 supralabials and 9-9 infralabials. A few specimens have 7-8 labials, in other forms as well as *klauberi* but only two other *ochrorhynchus* produces 23 dorsal rows, A.M. 15068 shows a very irregular number of rows all the way alone with 19 at the vent. M.C.Z. 43273 produces 23 rows from the 52nd to the 100th ventral and is uniform, that is, there are 21-23-21-19-17 rows. Twenty-three dorsal rows are not normal for any Hypsiglena unless *slevini* proves to be the exception. The double nape band is not encountered in any other *ochrorhynchus* except in two specimens from southern Sonora.

Specimens from the type locality are much darker in color than mainland specimens, in other respect the color pattern is similar and serves to readily distinguish this subspecies from all other forms. Fig. plate and photograph by C. B. Perkins, 1938, p. 44 clearly shows the divided lateral spot at the angle of the mouth, (see table 2). *Klauberi* is known to intergrade, in the north with *nuchalatus*, in the east with *deserticola*. Its relationship to *venusta* and *ochrorhynchus* at Cape San Lucus, are listed in the summary for the species.

HYPSIGLENA O. UNAOCULARUS Tanner, sp. nov., Pl. III, Figs. 4 and 8

Description

Head

Size and Proportion: The head is 43.3 per cent longer than wide, distinct from the body but not prominently so, flattened between the orbits and posterior, slightly convex over the internasals and pre-frontals, and rapidly tapering to the broadly rounded snout.

Scutellation: Rostral as seen from above 1.1 mm.; rostral to frontal 3.1 mm.; internasals moderate and tending toward squareness, wider posteriorly; pre-frontals large, wider than long; other cephalic plates normal. Nasal scute divided at the nostril which is located nearer the internasal than the labial and divides the nasal scute near the middle, posterior part wedging part way between the loreal and the

second labial. Anterior loreal large, noticeably longer than high; a small sub-loreal at the lower posterior corner of the large scute, contacts the 2nd and 3rd labials and both preoculars; two subequal preoculars, the dorsal scute many times larger. Eye moderate to large, its diameter 2.5 mm.; greater than one half the interorbital space; postocular a single scute; temporals 1-2-3, the anterior largest and in contact with the 5th, 6th, and 7th supralabials; supralabials 8-8, 4th and 5th enter the orbit and the 6th is the largest; infralabials 10-10, the first pair is partly divided by the mental, and the 6th is the largest; genials in two pair the posterior ones not completely divided and larger; eight gulars between the posterior genials and the 1st ventral, seven gulars between the 10th labial and the midventral line.

Dentation: There are 8 subequal superior premaxillary teeth followed after an interspace by one large smooth fang-like tooth.

Coloration: Cephalic plates with a light gray background flecked with innumerable brown spots of variable size and shape to produce a brown color. Supralabials with fewer and finer flecks below and in front of the orbit. The posterior four are marked with a dark bar that extends to the lateral nuchal blotch which is small and much less noticeable than in other forms. The medial nuchal blotch is elongate, extending from the second scale posterior to the parietals back for a distance of 8 scales gradually widening until it reaches a width of 7 rows at the posterior. Infralabials, genials and gulars with fine flecking over a cream background, except for a small narrow bar which extends from the mental back across the first four labials.

Dentition: There are 8 subequal anterior superior premaxillary teeth followed after a short distema by 1 large smooth fang-like tooth.

Body and Tail

Size and Proportion: The body is subcylindrical, and apparently long and slender. (Specimen in a poor state of preservation a short distance back of head and almost to tail.) Total length 480 mm. Tail 95 mm. (several mm. of tip missing); ratio tail to total length 19.9%.

Scutellation: Dorsal scales smooth except for a few scales above the vent which are weakly keeled, one apical pit, and in 21-21-19-17-15 longitudinal rows, reducing to 19 rows at the 124th ventral. There are 184 ventrals and 59 subcaudals present, several not accounted for since the tip of the tail is missing.

Coloration: A median series of larger dark brown spots and three lateral series of smaller spots extend from the nape region posteriorly, producing a brownish spotted ground color; dorsal spots 68, tail with

few spots and a more grayish color, median spots 2-2½ scales long, extending across the back from the 8-15 scale rows (some divided) of dorsal spots involving 15-16 scales. Scales between the spots colored the same as the scales lateral to the spots, that is very finely flecked. First lateral row on the 5-7 rows and involving 4-5 scales; the 2nd and 3rd lateral rows are found on the 3-4, 1-2 rows respectively, and involve usually less than 3 scales; ventrals cream to white colored and with the lateral edges finely flecked, caudals the same except that some scutes may have medial flecking.

Type: American Museum of Natural History No. 62756, an adult male from Clarion Island, the most southwestern of the Revilla Gigedo Island Group, Mexico.

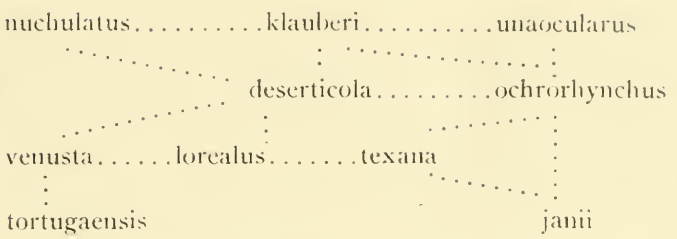
Diagnosis: Like *o. ochrorhynchus* in scutellation except for a single postocular and two loreal scales, and with an apparently higher number of ventral and caudal scutes. Tail long 19.9% of total length, and with the scales between the dorsal spots the same color as those scales lateral to the spots, not lighter as in other forms.

Remarks: Out of over 400 specimens studied to date nine specimens exhibit a single postocular scute and seven of these produce this condition on only one side. It is noteworthy, however, to find that it occurs mainly in specimens from San Diego Co. California and from specimens taken in parts of Utah. In a few specimens the postoculars show 3 scales but in 98% of the continental (including near-by islands) specimens there are 2 postocular scales. The paired loreal scutes are equally rare in all forms, except for *lorealus* in which two scutes are normal. Of equal interest is the 2-3 preocular count a variation very rarely encountered in other forms. On the basis of these head scale variations and the fact that the color between the spots is heavily pigmented plus the geographical isolation, seems to warrant the giving of this form a new name.

It will not be surprising to find this form producing a high ventral and caudal count as well as a longer tail in proportion to the body when and if a series can be collected.

SUMMARY OF THE OCHRORHYNCHUS GROUP

It is evident in the subspecies of *ochrorhynchus* that *janii* represents the most primitive form, and that from it a line of continuous evolution seems to have proceeded to *texana* and *ochrorhynchus* (Arizona), from which all other subspecies were directly or indirectly derived.



A comparison of *janii* with *texana* shows: (1) A close relationship in numbers of ventrals and caudals. (2) A similarity in the amount of pigmentation, both are dark heavily pigmented forms. (3) The spots are of the same size and are separated usually by less than one scale. (4) The dorsals are in 21-19-17 rows in both forms. The evolvment of *texana* from *janii* can be seen from (1) the three nape spots in *texana* in contrast to the extensive dark blotch of *janii;* (2) *texana* produces a constant number of labials (see table 2). The ranges of the two are in contact in Mexico, with the intergrades producing an intermediate nape pattern.

That *o. ochrorhynchus* is a derivitive of *janii* is seen from the following relationships, (1) forty per cent of the Arizona specimens have a narrow nape blotch. (2) Considerable overlapping in the caudals. (3) While no intergrades are available it appears that the range of each form is in contact with each other. (4) Eighty-two per cent of *o. ochrorhynchus* have fused lateral spots.

A much wider variation is readily seen between these two forms, that is in evidence between *janii* and *texana*. In scalation *ochrorhynchus* produces (1) an average of 13 more ventrals and rarely overlaps *janii*. (2) A much higher ventral caudal total. (3) Only 29 percent of its population retain 17 dorsal rows at the vent, *janii* produces 17 rows regularly. (4) More and smaller dorsal spots. Besides these it should be noted that the caudals average higher in *ochrorhynchus* and there are also a few (22.58 per cent) specimens whose total ventral caudal count exceeds 234 scutes. The amount of pigmentation is noticeably reduced in *ochrorhynchus*, and the distance between the dorsal spots is usually twice as great in *ochrorhynchus* as in *janii*.

In spite of all these differences it seems quite improbable that any other form could have given rise to *ochrorhynchus*, especially those from the Arizona-Mexico area. *Texana* has produced intergradation with *ochrorhynchus* in New Mexico and the big bend area of Texas, but the main evolutionary trends appear to have come from a north-south dispersion. The steady increase in the numbers of ventrals,

caudals, and dorsal spots is from *janii* through *ochrorhynchus* to *deserticola*. The reverse of this is true in the amount of pigment; the per cent of specimens producing a single nape band and in the per cent of specimens producing 17 dorsal rows at the vent (see table 2). If *texana* has effected the development of *ochrorhynchus* it must surely have been secondary. *Texana* is either of recent origin or the processes of variation have proceeded more slowly than is evident in other forms.

The method and routes of dispersion used by this species throughout western United States and Bajo California cannot be accurately interpreted at this time, especially for parts of Baja California. Specimens west and north of the Colorado river (*deserticola*) have developed (1) higher ventral and caudal counts (2) a ventral caudal total generally above 235 scutes (3) a characteristic medial nape spot and (4) few specimens with 17 dorsal rows at the vent. The relationship of *ochrorhynchus* and *deserticola* are seen in (1) the same degree of pigmentation (2) the same number and size of dorsal spots with *deserticola* averaging a few more. (3) Intergradation in the ventrals and caudals and (4) the contact of the ranges of both forms. Specimens throughout the entire great basin area show a remarkable uniformity in both scalation and color pattern. The fluctuations found in specimens from various parts of this vast area are very slight, specimens from Washington County, Utah produce the highest number of ventrals and caudals of any form, specimens from eastern San Diego County are light colored while Mona and Inyo County, California produce fewer caudals. The effects of geographical isolation are clearly seen in specimens from the Colorado river area of Utah. These specimens (*lorealus*) are quite the same as *deserticola* except for the double loreal. No doubt this form is an off shoot of those specimens now found in Washington County, Utah; they have identical scalation, except for the loreal, and also a near identical color-pattern.

The sub-species *deserticola* not only gave rise to *lorealus* but is also very closely related to *venusta*. This relationship is seen from, (1) the overlapping of the ventrals and caudals. (2) a great number of dorsal spots (3) a complete lateral nape spot and (4) a few specimens of *venusta* have a similar median nape spot. They vary in that *venusta* has (1) a greater average number of dorsal spots (2) smaller dorsal spots (3) more pigment in the nape spots (4) a division of the dorsal spots to form two separate rows. The latter character has carried into the medial nape spot where it produces a division in a few speci-

mens (Carman Island). *Venusta* produces a lateral nape spot that extends through the eye to the nostril a factor not common to any other group. Just where these two desert forms intergrade, if at all, is not known. Between them, as we now know them, extends a thousand mile strip of desert coast from Santa Rosalia, lower California, north to eastern San Diego and Emperial Counties, California, from which I have seen no specimens.

Tortugaensis is related to *deserticola* through *venusta*. *Tortugaensis* and *venusta* are virtually alike in (1) number of ventrals (2) number of dorsal spots (3) extent and size of lateral nape spots. The first two characters are very important in that all three forms overlap these factors. The latter, however, shows closer relationship between *tortugaensis* and *venusta* than between *deserticola* and *tortugaensis*. A comparison of *tortugaensis* with *venusta* shows the following differences, (1) more caudals (2) larger dorsal spots (3) a longer, narrower medial nape spot, and (4) a higher ventral-caudal total.

Intergrading exist between *venusta* and those *ochrorhynchus* found on Cape San Lucas. (1) In the number of ventrals. (2) Number of caudals. (3) Nape pattern. In the first two the overlapping is slight and occurs in specimens from La Paz (see table 2). The nape pattern is similar in about half of the specimens. They differ noticeably in (1) number of dorsal spots, *venusta* has 63 or more, *ochrorhynchus* has less than 60, intergrades produce a higher number. (2) Size of dorsal spots. (3) Distance between spots. The differences are in no way restricted to the color pattern. Both the ventrals and caudals average much higher, and the ventral-caudal totals are, with one exception, 230 or more in *venusta*, with less than 230 in all but two specimens of *ochrorhynchus*. The dorsal scales are more often in 15 rows at the vent in *venusta* than in *ochrorhynchus*. It appears then that *venusta* is more closely related to *deserticola* than to *ochrorhynchus*, and must have had a southward dispersion from southern California.

A comparison of *ochrorhynchus* with *klauberi* shows (1) a close resemblance in size and number of dorsal spots. (2) The same number of ventral and caudal scutes. (3) Ventral-caudal totals are equal. The two forms are different in that, (1) the lateral nuchal stripe is complete in *ochrorhynchus* but is divided in *klauberi*. (2) The median nuchal spot is elongate and reaches within a scale of the parietals in *ochrorhynchus;* in *klauberi* over 70% have a median spot 2-6 scales posterior to the parietals, or a divided median spot. *Klauberi* is related to *nuchalatus* (1) caudals are completely overlapping, (2) number of dorsal spots are the same, and (3) the ranges are adjoining and

produce intergrades. They differ in that *nuchalatus* has (1) a greater number of ventrals (2) a high ventral-caudal total (3) a complete nape band (4) a complete lateral stripe from the band to the eye (5) only 19 dorsal rows at the middle of the body and (6) only 7 infralabials.

Nuchalatus is related to *deserticola* in having (1) a similar number of ventrals (2) only a few scales in the ventral-caudal totals (3) only 15 dorsal rows at the vent and (4) a complete stripe from the lateral spots to the eye. They differ in that *nuchalatus* has (1) fewer caudals (2) a complete nape band, (3) only 19 scale rows at the middle of the body and (4) only 7 infralabials.

The new form *unaocularis* is unquestionably an *ochrorhynchus*. It differs from all in having a unique color pattern, and in the decrease of the postoculars. It is related to typical *ochrorhynchus* and to *klauberi* in the number of ventrals and in the size of the dorsal spots. I hesitate to assign it to any definite phylo-genetic place; first, because it is a single specimen not in a good state of preservation and second, because some of its characters may not be normal for the form, when more specimens are available for study.

HYPSIGLENA SLEVINI Tanner, Pl. III, Fig. 6

Hypsiglena ochrorhynchus ochrorhynchus Van Denburgh, The Reptiles of Western N. America, Occasional Papers of the Calif. Acad. of Sci., Vol. II, Snakes and Turtles, p. 782, 1922.

Hypsiglena slevini Tanner, Two New Species of Hypsiglena from Western North America, Great Basin Naturalist, Vol. IV, Nos. 1 & 2, pp. 53-54, June 30, 1943. Smith and Taylor, Proceedings of the U. S. Nat. Mus., Bull. 187, 1945, p. 74.

Hypsiglena torquata ochrorhynchus Bogert and Oliver, Amer. Mus. Nat. Hist. Bull., Vol. 83, Art 6, 1945, pp. 378-81.

General Diagnosis

A Hypsiglena characterized by having a distinct head with a blunt snout by reason of the small compressed rostral, .5 mm. long and 2.1 wide, distance from rostral to frontal 2.3; internasals nearly square; eye large its diameter 2.3, greater than the distance from the orbit to the nostril (1.8), also greater than half the interorbital space, parietals large and extending laterally to contact the lower postoculars; the frontal is narrower between the orbits than the anterior or posterior parts; other head plates are normal. Ventrals and subcaudals, 190 and 68 respectively, dorsal scale rows in 21-23-21-19-17-15 rows; tail long 18.9 per cent of total length. Nape with a distinctive color pattern of five spots, 3 anterior and the two large posterior spots.

RANGE: Known only from the type locality, Puerto Escondido, Lower California, Mexico.

MATERIAL: The type specimen C.A.S. 53631 Puerto Escondido, Baja California.

REMARKS: In comparing this species with other forms of back fanged snakes it is found that it resembles very closely the specific characters of many *Leptodeira*. The general appearance of the head is that of a Leptodeira but its smooth fangs, reduced number of anterior premaxillary teeth (8), a single apical pit in each dorsal scale and its short tail 18.9 per cent of the total length, (long for a Hypsiglena) places it as a unique species of *Hypsiglena*.

After completing the above notes, Charles M. Bogert and James A. Oliver published a report (1945, p. 381) in which this species is considered as being a synonym of *ochrorhynchus*. It appears that they base these conclusions on, (1st) the fact that it is a single specimen, collected from the same peninsula as *ochrorhynchus* and *venusta*, (2nd) that the ventral count of 190 is within the reported range (160 to 199) report by Klauber and Woodbury, (3rd) that 68 caudals scarcely exceeds the maximum reported by Klauber, (4th) "the fact that the parietals are in contact with the lower postocular indicates that the upper postocular has fused probably as an abnormality, with the parietals" and (5th) that the terms blunt snout and large eye is meaningless without further data to substantiate them.

In answering these conclusions it is only fair to say that they were apparently made without either Bogert or Oliver ever having seen the specimen in question. It is not a trifle astonishing then to find that the distinguishing characters or, to them, "abnormalities." The fact that a new Hypsiglena should come from Lower California is not an impossibility, two species of various genera, Coluber, Thamnophis and others commonly occur at the same dens. Furthermore, Lower California has only been partially worked as a collecting ground. The ventrals are high and the caudals do exceed by several scutes any other specimen studied or reported in the literature to date. The probability that the parietals and upper postoculars have fused, producing an abnormality is a gross mis-statement. It is clearly reported (Tanner 1943, p. 53) that the postoculars are 2-2 and that the dorsal scale is the larger. It is also stated that the "parietals" are in contact with "both postoculars." The snout is blunt, by reason of a compressed rostral which measures only .5 mm. In this character *slevini* is very much like specimens of Leptodeira. That is, the length of the rostral visible from above is 21% of the distance from the rostral to the

frontal. In Leptodeira it varies from 10-20%, (I have checked only a few specimens) and in Hypsiglena from 30-60%, with well over 50% of the specimens ranging between 35-50%. The eye is large, especially when one considers that for a specimen of *ochrorhynchus* to produce as large an eye it must be about twice the size (430 mm.) of the specimen in question. The eye is measurable in any specimen available for comparison and since the eye was reported as having a diameter of 2.3 mm., it might easily have been checked in specimens having a comparable size.

Furthermore *slevini* is characterized by having 23 dorsal rows from the 38th to the 114th ventral; 258 ventral-caudal scutes, exceeded only by a female specimen from St. George, Utah; and a nape pattern of five spots instead of the typical three found in most *ochrorhynchus*.

GENERAL SUMMARY

A careful study was made of the scale formulas, color pattern, maxillary teeth and body proportions of over 400 specimens of Hypsiglena. This data was then compared with similar data secured from several species of Leptodeira and with specimens belonging to *Pseudoleptodeira latifaciata* Günther. As a result of this study the writer is convinced that the genus Hypsiglena is distinct from Leptodeira, also that Pseudoleptodeira is a valid genus consisting of two and probably three species.

This study supports the conclusion that the genus Hypsiglena may be divided into five species, *torquatus*, *affinis*, *dunklei*, *slevini*, and *ochrorhynchus*. The last named is divided into ten subspecies, as follows: *ochrorhynchus*, *janii*, *texana*, *venusta*, *nuchalatus*, *deserticola*, *lorealus*, *klauberi*, *tortugaensis* and *unaocularus*, the last five are described as new in this report.

The snakes of this genus form a natural group which extends from Central America through Mexico and into western United States. It appears that the genus may have had its origin in Mexico, and that *ochrorhynchus* dispersed itself northward and is now a Nearctic species while *torquatus* moved southword and is neotropical.

Besides the descriptions, there are keys, data tables, plates and a distributional map of the genus.

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PLATE I

Fig. 1 Distribution of the gastrosteges in the subspecies deserticola and klauberi.

Fig. 2 Distribution of the urosteges in the subspecies deserticola and klauberi.

Fig. 3 Distribution of the gastrosteges-urosteges totals for the two subspecies.

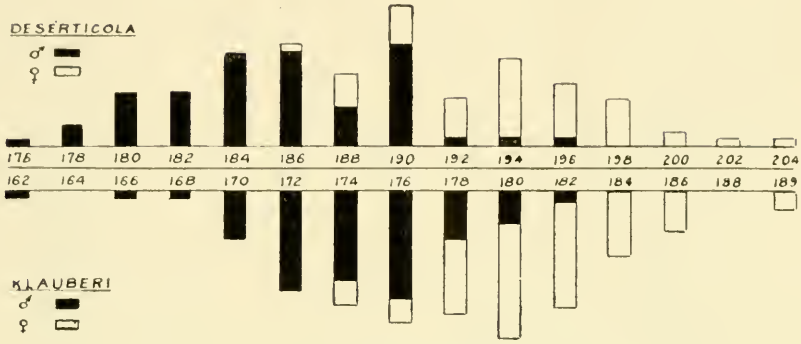

FIG 1
GASTROTEGES

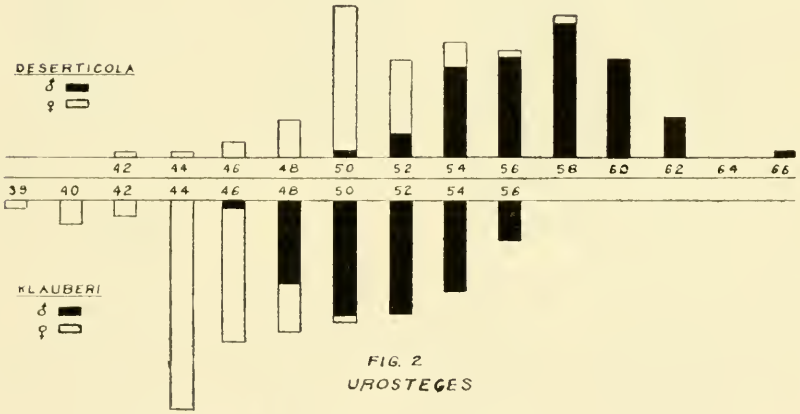

FIG. 2
UROSTEGES

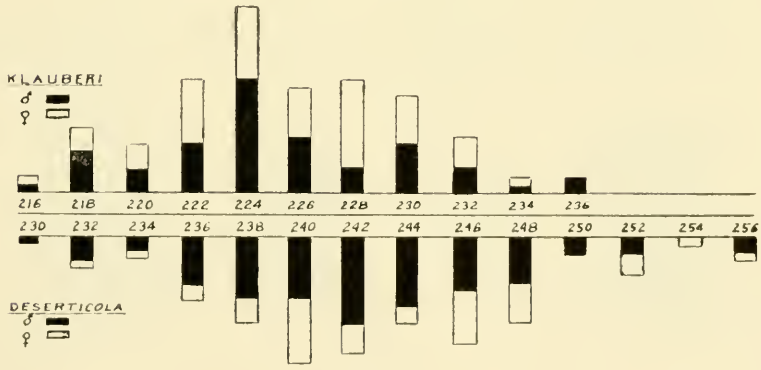

PLATE I

FIG. 3
GASTROSTGES-UROSTEGES TOTAL

PLATE II

Fig. 1 Lateral view of the type specimen of *lorealus* B. Y. U. No. 2829. Showing color pattern and the double loreals.

Fig. 2 Dorsal view of *affinis*. E.H.T. No. 4601 showing the large light and dark colored nape bands.

Fig. 3 Dorsal view of *tortugaensis*, type specimen C.A.S. 51460. Showing the elongate medial nape spot.

Fig. 4 Lateral view of *tortugaensis*, type specimen. Showing the divided lateral nape spot.

Fig. 5 Lateral view of *janii* M.M.Z. No. 77243. Showing the dark enlarged nape band.

Fig. 6 Lateral view of *affinis* E.H.T. No. 4601.

Fig. 7 Lateral view of *Pseudoleptodeira latifaciata* Günther.

Fig. 8 Dorsal color pattern of the type specimen of *lorealus*. Showing the small size and great distance between the spots.

Fig. 9 Dorsal color pattern of *torquata* E.H.T. No. 5564. Showing the large dark spots and the half scale that separates each spot.

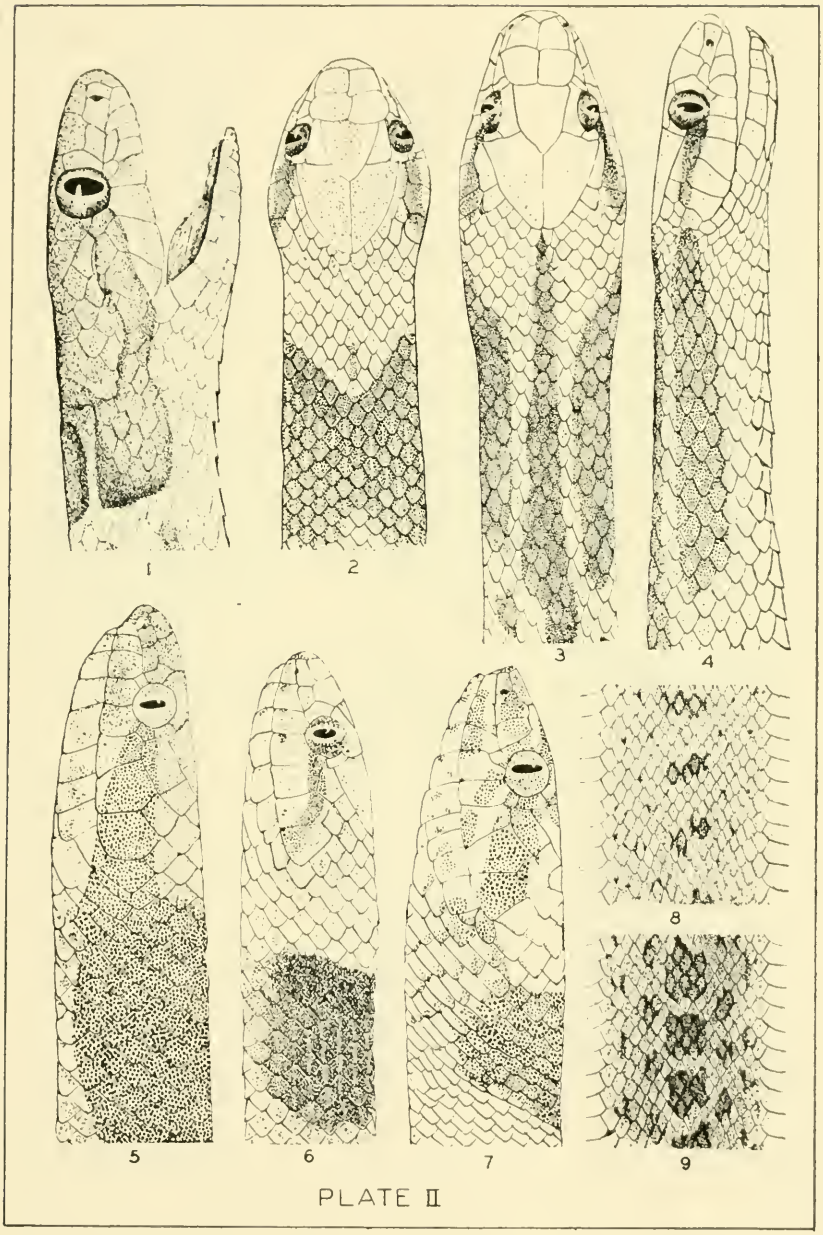

PLATE II

PLATE III

Fig. 1 Dorsal view of a typical specimen of *torquata* E.H.T. No. 23477.

Fig. 2 Dorsal view of the type specimen of *o. nuchualatus* B.Y.U. No. 3008.

Fig. 3 Dorsal view of the type specimen of *o. deserticola* B.Y.U. No. 2836.

Fig. 4 Lateral view of the type specimen of *o. unaocularus* A.M. No. 62756. Showing the single postocular and the small and large loreal scales.

Fig. 5 Lateral view of a typical *Hypsiglena* B.Y.U. No. 2709. Showing the arrangement of dorsal scales, their reduction to fewer rows and the location of the apical pit in each scale.

Fig. 6 Dorsal view of *slevini* C.A.S. 53631.

Fig. 7 Dorsal color pattern of *o. venusta* C.U. No. 13775. Showing the divided dorsal spots.

Fig. 8 Dorsal color pattern of *o. unaocularus*. Showing the uniform color between and lateral to the dorsal spots.

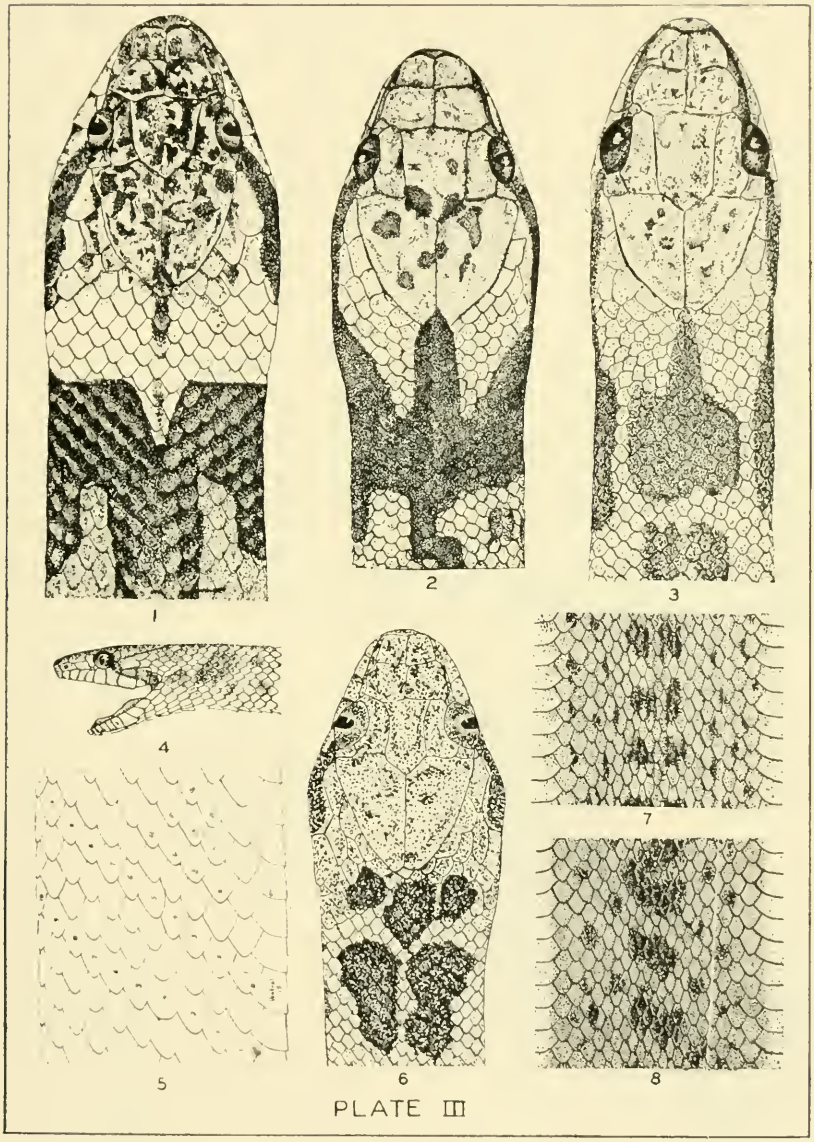

PLATE III

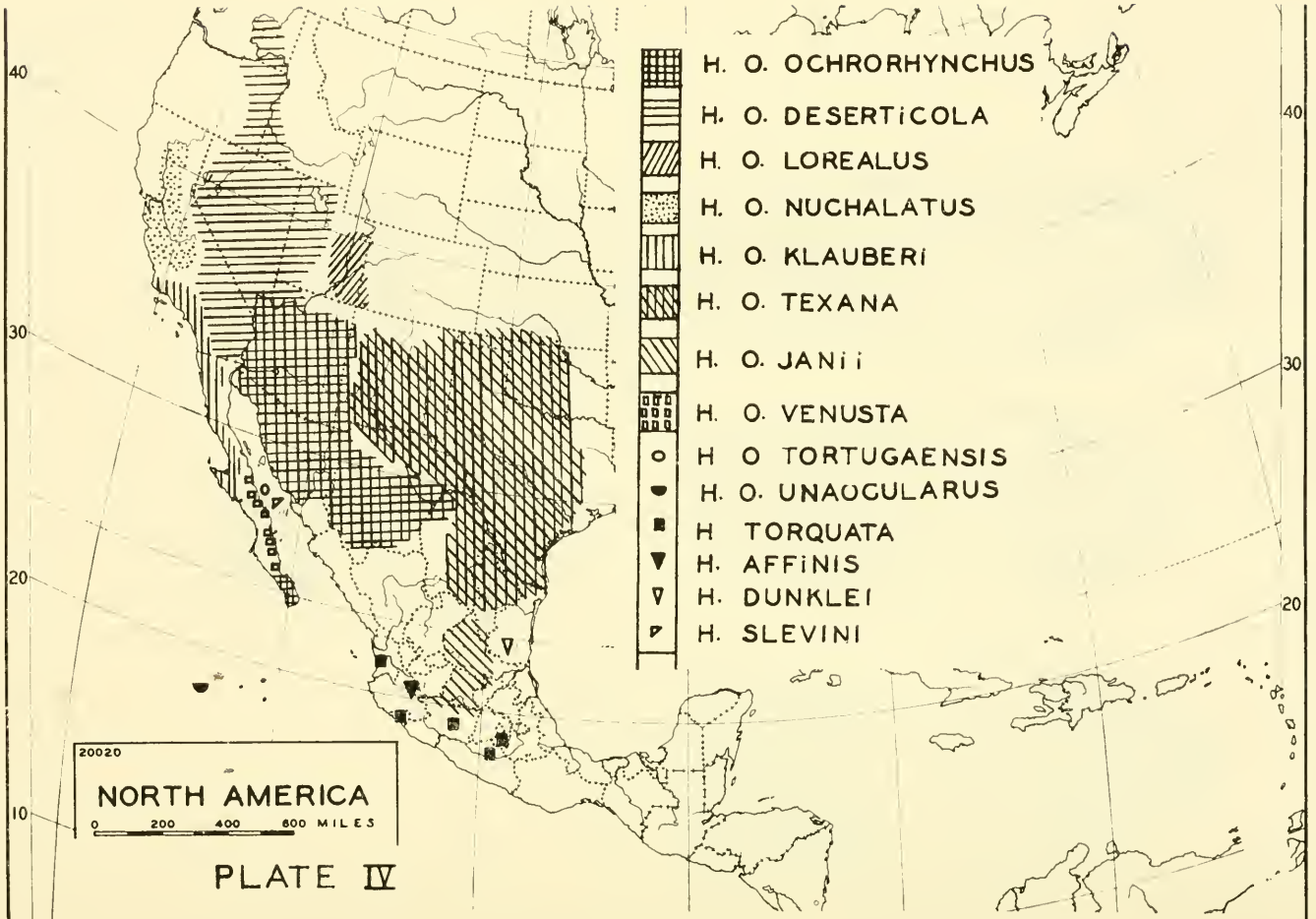

PLATE IV

DISTRIBUTION OF THE GENUS HYPSIGLENA

UNDESCRIBED SPECIES OF WESTERN NEARCTIC TIPULIDAE (DIPTERA). II.

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The preceding part under this general title was published in The Great Basin Naturalist, 4: 89–100; 1943. The species of crane-flies considered at this time were taken in northeastern California by Professor Arthur W. Lindsey, and in Washington and northern Idaho by Professor Axel L. Melander. Except where indicated to the contrary in the text, the types of these novelties are preserved in my personal collection, a gracious favor on the parts of the collectors for which I am most grateful.

Tipula (Arctotipula) sacra Alexander, sp. n.

Size relatively small (wing, male, 11.5 mm.); general coloration light gray, the praescutum with four more brownish gray stripes; wings brownish gray, virtually unpatterned except for the brown stigma; macrotrichia on certain veins beyond the cord, including the distal section of R_{4+5}, M_1 and M_2; abdominal tergites obscure orange-brown, with a broad dark brown, median stripe; male hypopygium having the ninth tergite with a U-shaped caudal emargination, the lobes obtuse; ventral surface of tergite on either side of median line with a bilobed plate; outer dististyle moderately flattened, about three times as long as the greatest width; inner dististyle simple, its beak broadly obtuse, outer margin near base produced into a flattened plate that terminates in two blackened spines.

Male.—Length about 10 mm.; wing 11.5 mm.; antennae about 3 mm.

Frontal prolongation of head relatively short, dark brown above, somewhat paler below; nasus unusually long and powerful; palpi chiefly dark brown, the terminal segment paling to brownish yellow. Antennae with scape obscure yellow, pedicel clearer yellow, flagellum dark brown; proximal flagellar segments short-cylindrical, the basal enlargement very poorly developed; longest verticils about one-fourth longer than the segments. Head gray, the center of posterior vertex brown, the area narrowed in front, broadly expanded behind; anterior vertex broad, approximately six times the diameter of the scape; no evident vertical tubercle.

Pronotal scutum light gray, infuscated medially; scutellum clear light yellow. Mesonotal praescutum light gray with four more brownish gray stripes that are very vaguely margined with darker; humeral triangle light yellow; vestiture of praescutum pale, short and inconspicuous; posterior sclerites of notum gray; scutum of unique type discolored; parascutella nacreous, the adjoining posterior portions of the scutal lobes yellow; postnotum with lateral borders of mediotergite yellow, the katapleurotergite extensively of this color, only its ventral portion gray pruinose. Pleura chiefly light gray, the extreme dorsal portions of the sternopleurite and meron vaguely still paler gray; dorsopleural membrane clear yellow. Halteres with stem brownish yellow, knob weakly infuscated, its apex a little paler; base of stem restrictedly orange. Legs with coxae light gray, their apices restrictedly obscure yellow, clothed with abundant long white setae from brown punctures; trochanters yellow; femora yellow, their apices dark brown, relatively narrow and subequal on all legs; tibiae obscure brownish yellow, the tips very narrowly darkened; tarsi black; claws (male) with a single tooth. Wings brownish gray, almost unpatterned except for the brown stigma; a faint brown seam along virtually the entire length of vein *Cu*; obliterative areas very restricted and inconspicuous; veins brown. Macrotrichia of veins beyond cord relatively abundant, appearing as a complete series on distal section of R_{4+5}, on most of veins R_{2+3} and M_1, and with two or three trichia on vein M_2. Venation: R_{1+2} entire; *Rs* less than twice R_{2+3} and about twice *m-cu*; petiole of cell M_1 short, somewhat variable, shorter than *m*.

Abdominal tergites obscure orange-brown, with a broad, dark brown, median stripe, almost continuous on the more proximal segments, the posterior borders of the intermediate segments pale, interrupting the stripe; sternites brown basally, the posterior borders broadly pale; outer segments more uniformly dark brown; hypopygium in large part yellow. Male hypopygium with the ninth tergite transverse, narrowed posteriorly, with nearly the cephalic half darkened, the posterior border broadly yellow; caudal margin with a U-shaped emargination, the lobes low and obtuse; on ventral surface of tergite, on either side of midline, with a pale yellow, feebly sclerotized plate that is unequally bilobed, the posterior arm an acute spine directed caudad and laterad, the cephalic arm obtuse at apex, directed laterad. Outer dististyle relatively narrow, flattened, the length about three times the greatest width which is at near midlength; apex obtuse. Inner dististyle simple, the beak broad, obtuse at tip; outer margin near base produced into a flattened plate that bears two acute spines, the

outer one more slender; margin of style immediately distad of these spines with a group of about six strong setae; outer basal portion of style a low obtuse pale cushion that is densely setuliferous. Aedeagus short, subtended by slender and very inconspicuous gonapophyses.

HABITAT.—Northern Idaho.

HOLOTYPE, ♂, Priest Lake, Tule Bay, Bonner Co., August 22, 1920 (Melander).

Tipula (*Arctotipula*) *sacra* is quite distinct from the other regional members of the subgenus, including two larger species with patterned wings, *T.* (*A.*) *semidea* Alexander and *T.* (*A.*) *twogwoteeana* Alexander, and two further species of entirely different color and structure, *T.* (*A.*) *absaroka* Alexander and *T.* (*A.*) *plutonis* Alexander. The fly is more like certain of the arctic and subarctic members, as *T.* (*A.*) *aleutica* Alexander, *T.* (*A.*) *besselsi* Osten Sacken, and *T.* (*A.*) *besselsoides* Alexander all differing among themselves in hypopygial characters. The present fly superficially resembles a species of the genus *Prionocera* Loew. At this time it may be noted that various species hitherto referred to this latter genus without question are in reality modified species of the genus *Tipula* and would apparently fall within the limits of *Arctotipula* without serious changes in the subgeneric definition. The species concerned are *Prionocera parrioides* (Alexander), of Arctic Alaska, and *P. fuscipennis* (Loew), widespread across the entire northern United States and adjacent Canada. In transferring the latter species to *Tipula*, the name is preoccupied by the earlier *Tipula fuscipennis* Curtis, and the fly will have to be known by its later name and supposed synonym, *Tipula* (*Arctotipula*) *illustris* Doane.

Limnophila (Elaeophila) modoc Alexander, sp. n.

General coloration of mesonotum dark gray, the praescutum with four scarcely defined, more plumbeous gray stripes: pseudosutural foveae black, conspicuous; femora yellow, the tips narrowly brownish black; wings whitish subhyaline, patterned with dark brown, the areas confined to the vicinity of the veins; *m-cu* at near two-fifths the length of cell *1st* M_2; male hypopygium with the dorsal crest of outer dististyle relatively high, entirely smooth, on its outer portion sloping gradually down to the body of style, not forming a projecting point; inner dististyle at apex broad and obtuse.

MALE.—Length about 6.5 mm.; wing 7.5 mm.; antennae about 1.3 mm.

Female.—Length about 7 mm.; wing 7.5 mm.

Rostrum and palpi brownish black. Antennae with scape and pedicel dark brown, flagellum paler brown; basal flagellar segments oval, the outer ones more elongate; longest verticils fully one-half longer than the segments; verticils of more proximal segments unilaterally distributed. Head brownish gray; anterior vertex relatively broad, in male about three times the diameter of scape.

Pronotum brownish gray, the scutellum and anterior pretergites somewhat brighter. Mesonotal praescutum dark gray with four scarcely defined, more plumbeous gray stripes; pseudosutural foveae black, conspicuous; posterior sclerites of notum dark leaden gray. Pleura dark plumbeous gray, somewhat brightened on the dorsal sternopleurite; dorsopleural membrane brownish yellow. Halteres yellow. Legs with coxae and trochanters reddish yellow; femora yellow, the tips rather narrowly but conspicuously brownish black, the amount subequal on all legs; tibia yellow, the extreme tips not or scarcely darkened; basal tarsal segments yellow, the outer ones more infuscated. Wings with the ground whitish subhyaline, patterned with dark brown, the areas relatively small and restricted to the vicinity of the veins, as follows: Over *h* and arculus, sending a spur along vein *Cu* for a distance; midway between arculus and origin of *Rs*, not quite reaching *C*, behind extending to near midwidth of cell *R*; a rectangular area at origin of *Rs*; fork of *Sc*, extending caudad to *Rs*; stigma; narrow but very conspicuous seams over cord and outer end of cell *1st M*2; fork of *M*1+2; marginal clouds on veins *R*3, *R*4, *M*2 to *Cu*, inclusive, and over *2nd A*; veins yellow, darker in the patterned areas. Venation: *Sc*1 ending shortly before fork of *Rs*, *Sc*2 a short distance from its tip; *Rs* long, square and spurred at origin; *R*2 shorter than *R*1+2; *m-cu* at near two-fifths the length of cell *1st M*2.

Abdominal tergites indistinctly bicolored, obscure yellowish brown on more than the basal half of segment, the broad tips dark brown; segments seven and eight more uniformly brownish black; hypopygium light brown. Male hypopygium with the outer dististyle moderately wide, terminating in a slender spine, the distal portion, especially the outer crest, with microscopic appressed denticles; inner margin with fewer teeth, the more basal of these very low and obtuse; dorsal crest relatively high, entirely smooth, on its outer portion sloping gradually down to the body of style, without a projecting point or tooth, as in other related species. Inner dististyle at apex very broad and obtuse, provided with very long setae.

Habitat.—Northeastern California.

Holotype, ♂, Davis Creek, Modoc Co., altitude 5,000 feet, July 11, 1922 (Lindsey). Allotopotype, ♀.

The present fly is most similar to *Limnophila (Elaeophila) aldrichi* Alexander, and its subspecies *alticrista* Alexander, differing in the smaller size, slight details of coloration, and in the structure of the male hypopygium, particularly of the dististyles, as indicated above.

Gonomyia (Idiocera) lindseyi Alexander, sp. n.

Belongs to the *scarguttata (blanda)* group; mesonotal praescutum and scutum gray, traversed by an intermediate pair of longitudinal brown stripes; thoracic pleura conspicuously striped with yellowish white; femora and tibiae yellow, the tips weakly infuscated; wings whitish subhyaline, patterned with brown; *Sc* long, *Sc*1 ending about opposite midlength of *Rs*; *R*1+2 and *R*3 confluent at margin; male hypopygium with the outer lobe of basistyle obtusely rounded at apex; outer dististyle a sinuous blackened rod, constricted on its basal third; intermediate style a little longer, its tip acute, bearing a small erect black spine on face at near midlength; aedeagus at apex terminating in a small yellow crook.

Male.—Length about 5.5 mm.; wing 6.5 mm.

Female.—Length about 6.5 mm.; wing 7 mm.

Rostrum and palpi black. Antennae brownish black, the scape yellow at base and above; flagellar segments oval, the outer ones more elongate. Head yellow, the center of vertex extensively infuscated; anterior vertex relatively wide, about twice the diameter of scape, a little wider in the female.

Pronotum light gray medially, more infuscated toward the sides, the extreme margin light yellow; pretergites light yellow. Mesonotal praescutum gray, with a pair of brown stripes extending the whole length of the sclerite, the humeral region more yellowed; pseudosutural foveae horn-yellow; lateral praescutal borders clearer gray, narrowly bordered internally by very vague indications of the usual lateral stripes; scutum medially obscure brownish fulvous, the extreme central portion narrowly more darkened, the central portion of each lobe traversed by the brown stripes above described, the outer part of lobe gray; scutellum infuscated medially, the posterior border reddened; mediotergite with central portion brownish gray, with a conspicuous pale yellow spot on cephalic lateral portion, this extended cephalad over the anapleurotergite; katapleurotergite brownish gray. Pleura brownish gray, with a broad, yellowish white, longitudinal stripe extending from the fore coxae across the dorsal sternopleurite, ventral

pteropleurite and metapleura; dorsopleural membrane yellow. Halteres with stem yellow, the extreme base very weakly darkened, knob brownish black. Legs with the fore and middle coxae whitened, posterior coxae more infuscated; trochanters obscure yellow; femora and tibiae yellow, the tips narrowly and weakly infuscated; tarsi dirty white basally, the tips blackened. Wings whitish subhyaline, the base even more whitened; a conspicuous brown pattern, arranged as in the *blanda* group, including areas over *h*, arculus, origin of *Rs*, fork of *Sc*, stigma, elements of cord, fork of M_{1+2} and outer ends of cells R_3 and R_4; veins brownish yellow, dark brown in the patterned areas; *Sc* and prearcular veins almost white. Venation: *Sc* long, Sc_1 ending about midlength of the long *Rs*, Sc_2 near its tip; *Rs* angulated to square at origin; R_{1+2} and R_3 confluent at margin, closing cell R_1; cell *2nd* M_2 longer than its petiole; *m-cu* nearly twice its length before the fork of *M*.

Abdomen brownish black, the caudal borders of the basal and intermediate segments rather broadly and very conspicuously light yellow, producing rings; outer segments more uniformly darkened; hypopygium with the proximal portions of the basistyle infuscated, the outer parts yellow; in female, the genital shield and bases of the valves brownish black, the tips of the cerci paler. Male hypopygium with the outer lobe of basistyle obtusely rounded at tip, not acutely pointed, as in *brookmani* and *californica;* what appears to represent an inner lobe is very large and flattened, fully as long as the outer lobe. Outer dististyle a simple sinuous blackened rod, constricted on basal third, gradually narrowed to the acute tip; intermediate style a little longer, nearly straight, narrowed to the acute tip, on face of blade at near midlength with a small erect black spine; inner style about one-half as long as the last, appearing as a nearly straight rod, before apex a trifle expanded, thence narrowed to the acute, narrowly darkened tip. Aedeagus at apex terminating in a small yellow sclerotized crook. Ninth tergite with the caudal margin convexly rounded, moderately thickened, densely provided with short setae.

Habitat.—Northeastern California.

Holotype, ♂, Davis Creek, Modoc Co., altitude 5,000 feet, July 11, 1922 (Lindsey). Allotopotype, ♀.

I am very pleased to name this fly for the collector, Professor Arthur Ward Lindsey, of Dennison College, to whom I am greatly indebted for various species of Tipulidae. In the structure of the male hypopygium, especially of the dististyles, the species is entirely different from all other regional members of the group, being most similar to

Gonomyia (Idioccra) brookmani Alexander and *G. (I.) californica* Alexander but entirely distinct.

Erioptera (Mesocyphona) melanderiana Alexander, sp. n.

General coloration gray, the praescutum with two brown longitudinal stripes; thoracic pleura dark gray, with an obscure yellow longitudinal stripe; legs almost uniformly darkened; wings weakly tinged with brown, unpatterned; cell *1st M*2 closed.

Male.—Length about 3.5 mm.; wing 4 mm.

Female.—Length about 4 mm.; wing 4.8 mm.

Rostrum brown, palpi brownish black. Antennae with scape brown, pedicel brownish black, flagellum very pale brown; flagellar segments oval, the more proximal ones crowded, the outer segments elongate-oval; verticils long and conspicuous. Head dark brown, pruinose.

Pronotum brown and light yellow; pretergites yellow. Mesonotal praescutum gray with a conspicuous, dark brown, longitudinal stripe on either side of the wider gray median vitta; tuberculate pits lying entirely in the central gray stripe, on a transverse level with the black pseudosutural foveae; scutum gray, the mesal edge of each lobe dark brown; scutellum weakly infuscated at base, paling to obscure yellow outwardly; mediotergite gray on central portion, paling to obscure yellow on sides. Pleura and pleurotergite chiefly dark gray, with an obscure yellow, longitudinal stripe, extending from behind the fore coxae across the dorsal sternopleurite and pteropleurite to the base of abdomen, passing beneath the wing-root; dorsopleural region broadly yellow. Halteres with stem pale yellow, knob weakly darkened. Legs with the coxae and trochanters brownish yellow, the fore coxae somewhat darker; remainder of legs almost uniformly darkened, the femoral bases slightly brightened, toward the tips becoming vaguely more darkened but not forming a ring. Wings with a weak brownish tinge, unpatterned; prearcular field paler; veins pale brown. Venation: *Sc*1 ending nearly opposite *R*2; *Rs* relatively long, subequal to vein *R*3; cell *1st M*2 closed, *m* transverse, basal section of *M*3 subequal in length, oblique, cell *1st M*2 shorter than any of the veins beyond it; *m-cu* at the fork of *M*; vein *2nd A* sinuous on its outer third.

Abdomen chiefly dark brown, including most of the hypopygium. Male hypopygium of the normal type of the subgenus. Two dististyles, the outer one profoundly bifid, its base dilated; both branches slender, the outer one more so, at its apex terminating in four or five short crowded teeth; inner or axial branch gradually narrowed to the acute tip; inner style of about the same shape and curvature as the

inner branch of the outer style, its lower or concave margin on distal half with about five small scattered denticles. Gonapophyses appearing as flattened pale blades, a little dilated on distal half, the tips acute; surface of blades with faint longitudinal striolae.

HABITAT.—Washington.

HOLOTYPE, ♂, Mount Rainier, Paradise Park, August 1917 (Melander). PARATOPOTYPE, ♀, Mazama Ridge, July 23, 1922 (Melander); in Melander Collection.

This unusually distinct fly is dedicated to Dr. Axel Leonard Melander, who has added vastly to our knowledge of distribution of the Diptera throughout the United States. The species is entirely different from all others in the Nearctic region, especially in the unpatterned wings and closed cell *1st M*2.

Ormosia (Ormosia) pugetensis Alexander, sp. n.

Belongs to the *similis* group; general coloration light brown; antennae (male) elongate, approximately two-thirds the length of the body, the individual flagellar segments strongly narrowed outwardly; wings with cell M_2 open by the atrophy of the basal section of M_3; anal veins confluent or subparallel on their outer portions; male hypopygium with the margins of the tergal lobes erose, with conspicuous setae; gonapophyses black, both pairs simple and acutely pointed, the outer pair unusually long and slender.

MALE.—Length about 5 mm.; wing 5.2 mm.; antenna about 3.5 mm.

Rostrum brown, palpi relatively elongate, darker brown. Antennae (male) elongate; scape dark brown, pedicel obscure brownish yellow, flagellum dark brown; flagellar segments elongate, the proximal half of each dilated, thence narrowed very gradually to the apex, on the more basal segments, the stem restrictedly darkened at tip. Head dark gray.

Pronotum and pretergites obscure yellow, the former narrowly more reddened medially. Mesonotum light brown to medium brown, the tuberculate pits and pseudosutural foveae black; posterior sclerites of notum more strongly infuscated on central portions, the mediotergite paling to yellow on sides; pleurotergite yellow. Pleura uniformly yellow. Halteres with stem pale, knob weakly infuscated. Legs with the coxae and trochanters yellow; remainder of legs brownish yellow to light brown, the outer tarsal segments more strongly infuscated. Wings broad, with a weak brownish tinge, the narrow costal border and the stigma darker brown; veins brown. Venation: Sc_2 opposite midlength of Rs; R_{2+3} subequal to R_2; cell M_2 open by the atrophy of

basal section of *M3*; *m-cu* at fork of *M*; vein *2nd A* strongly sinuous on its outer half, narrowing cell *1st A*.

Abdomen, including hypopygium, dark brown. Male hypopygium with the tergite conspicuous, its caudal border deeply emarginate, the lateral lobes divergent, their margins irregular or erose, fringed with long setae. Dististyles almost as in other species of the group. Gonapophyses distinctive, two on either side, both pairs heavily blackened; outer pair appearing as unusually long and slender curved spines, directed mesad; inner or more cephalic apophyses shorter and stouter but likewise acutely pointed. The gonapophyses are of quite different conformation from those of either *decussata* or *longicornis*.

Habitat.—Western Washington.

Holotype, ♂, Puget, Thurston Co., July 4, 1925 (Melander).

Ormosia (*Ormosia*) *pugetensis* is most similar to *O.* (*O.*) *decussata* Alexander and to what I have determined as being *O.* (*O.*) *longicornis* (Doane), possibly erroneously (not having been able to examine the type). The present fly is readily told from these forms by the structure of the male hypopygium, particularly the gonapophyses.

Molophilus (Molophilus) subnitens Alexander, sp. n.

Belongs to the *gracilis* group, *nitidus* subgroup; size large (wing, male, 6 mm. or more); general coloration of body and appendages black; knobs of halteres light yellow; male hypopygium with mesal lobe of basistyle produced into two small acute spines; inner dististyle with the long arms diverging only slightly, one arm dark-colored and paddle-like, less than twice as wide as the yellow second arm.

Male.—Length about 5.2 – 5.6 mm.; wing 6 – 6.8 mm.; antenna about 1.5 – 1.7 mm.

Characters generaly as in *nitidus*, differing especially in the structure of the male hypopygium.

General coloration of the entire body black, the surface nitidous or subnitidous. Palpi, antennae and legs black. Halteres with stem black, knob light yellow. Wings a strong blackish suffusion; R_{2+3} long, from one-third to one-half longer than the basal section of R_5; *m-cu* oblique, angulated below midlength.

Male hypopygium approximately as in *nitidus* but differing in all details. Furcula of ninth tergite with the arms separated by a relatively broad U-shaped notch that is wider than either arm, the latter approximately as long as the width of the stem across its base. Basistyle with dorsal lobe a long, very slender spine; mesal lobe bearing two small acute spines that are separated by a U-shaped notch. Outer dististyle

a simple rod, dark brown and stouter on its basal two-thirds, thence narrowed into a long, gently curved black spine. Inner dististyle with arms diverging at only a slight angle, one arm tipped with yellow, the other paddle-shaped, uniformly darkened, subequal in length to and less than twice as wide as the second arm. In *nitidus*, the stem of the tergal furcula is much narrower across base; basistyle with a single mesal spine, but this of unusual length and slenderness; apical arms of inner dististyle greatly disproportionate in width, the broader one being approximately three times as wide as the narrow blade.

Habitat.—Eastern Washington.

Holotype, ♂, Valleyford, Spokane Co., May 29, 1921 (Melander); in Melander Collection. Paratopotype, ♂, in author's collection.

From the other large-sized member of the subgroup, *Molophilus* (*Molophilus*) *nitidus* Coquillett, the present fly differs in the hypopygial characters as above outlined. I now know *nitidus* from western Washington, western Oregon and northwestern California (Humboldt Co.; type-locality).

Molophilus (Molophilus) nitidulus Alexander, sp. n.

Belongs to the *gracilis* group, *nitidus* subgroup; size relatively small (wing, male, about 5 mm.); general coloration black, the lateral angles of the pronotal scutellum obscure orange-yellow; knobs of halteres yellow; male hypopygium with the furcula of the ninth tergite having short and broad arms; dorsal lobe of basistyle very slender, needle-like; mesal lobe bearing two small and inconspicuous, unequal spines, one short and peglike; outer dististyle a straight blade, flattened and twisted at near midlength; inner dististyle with both apical arms short and broad.

Male.—Length about 4.5 – 4.6 mm.; wing 4.9 – 5.1 mm.

Rostrum and palpi black. Antennae black throughout, short; flagellar segments oval, the outer ones more elongate. Head black, the surface sparsely pruinose.

Pronotum black, the lateral angles of the scutellum obscure orange yellow. Mesonotum black, the surface subnitidous; pseudosutural foveae and tuberculate pits black. Pleura and pleurotergite black, sparsely pruinose. Halteres with stem light brown, knob light yellow. Legs with the coxae and trochanters black; remainder of legs brownish black. Wings with a strong blackish tinge, the veins darker than the ground; a whitish streak along vein *M* to beyond its fork. Venation: R_2 lying shortly beyond the level of *r-m*; R_{2+3} arcuated, in the paratype angulated and short-spurred; petiole of cell M_3 a little longer

than the sinuous *m-cu*; vein *2nd A* moderately sinuous, terminating opposite the posterior end of *m-cu*.

Abdomen, including hypopygium, dark brown. Male hypopygium having the general structure of the *nitidus* group, differing from all allied species in the details. Furcula of the ninth tergite with the arms shorter and broader than in other species, each about as long as the width across the base of the stem. Basistyle with its dorsal lobe very slender, almost needle-like, from a dilated basal portion, at its origin bent at virtually a right angle; mesal region of style bearing two spines, one a small, inconspicuous, slender one, the second still smaller, peg-like. Outer dististyle a straight blade, flattened and twisted at near midlength, thence narrowed to the acute tip. Inner dististyle with both apical blades short and broad.

Habitat.—Eastern Washington.

Holotype, ♂, Almota, Whitman Co., May 20, 1923 (Melander); in Melander Collection. Paratopotype, 1 ♂, in author's collection.

Molophilus (*Molophilus*) *nitidulus* is well-distinguished from the other described members of the *nitidus* subgroup by the relatively small size and by the hypopygial characters, as above defined. It is perhaps closest to *M.* (*M.*) *millardi* Alexander, of southern California.

INDEX TO VOLUME V

Species described in this volume appear in bold-face type in this index.

Alexander, Charles P., article by, 93.

Disposition of the types of the genus Hypsiglena, 37.

Erioptera **melanderiana** Alexander, 99.
European Earwig found in Provo, Utah, 22.

Four devastating melanopli found in Utah, 1.

General summary, Hypsiglena, 82.
Genus Hypsiglena Cope, 32.
Genus Leptodeira Fitzinger, 32.
Genus Pseudoleptoderia Taylor, 31.
Gonomyia lindseyi Alexander, 9.
Grasshopper control in Utah, 18.

Henderson, Dr. William Williams (1879-1944), 23.
Henderson, W. W., article by, 1.
Hypsiglena affinis Boulenger, 46.
dunklei Taylor, 48.
O. ochrorhynchus Cope, 54.
O. **deserticola** W. Tanner, 59.
O. janii (Duges), 48.
O. **klauberi** W. Tanner, 71.
O. **lorealus** W. Tanner, 63.
O. nuchalatus W. Tanner, 63.
O. texana Stejneger, 51.
O. **unaocularus** W. Tanner, 74.
O. venusta Mocquard, 67.
O. **tortugaensis** W. Tanner, 69.
slevini Tanner, 80.
torquata (Gunther), 40.

Key to the Genera, Hypsiglena, 30.
Key to the species and subspecies of Hypsiglena, 38.

Limnophila **modoc** Alexander, 96.

Melanoplus bivittatus (Say), 9.
femur-rubrum (DeGeer), 14.
M. mexicanus (Saussure), 2.
packardii (Scudder), 6.
Molophilus **nitidulus** Alexander, 103.
Molophilus **subnitens** Alexander, 102.

Ormosia **pugetensis** Alexander, 100.
Other destructive grasshoppers, 2.

Summary of the Ochrorhynchus group, 76.
Synonymy chart for the genera Hypsiglena, Leptodeira, and Pseudoleptodeira, 35.

Tanner, V. M., articles by, 22, 23.
Tanner, W. W., article by, 25.
Tipula **sacra** Alexander, 93.

Undescribed species of western nearctic Tipulidae (Diptera). II., 93.

Date of mailing Nos. 1 and 2 — January 22, 1945.

Date of printing and mailing Nos. 3 and 4 — September, 1946.

Note.—The paper dealing with Hypsiglnea was practically finished and assigned to Volume V in 1944, but due to war conditions not under our control, it has been impossible to get Nos. 3 and 4 published until the present time. Several articles that appeared in 1945 are referred to in this paper. It is hoped that the reconversion program will make it possible for the printing and distribution of this publication to proceed on schedule.—Editor.

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